Engineering Photography.*

In discussing photography this evening, I wish what I have to say to be taken rather as a progress report than as the dictum of an expert, which I certainly do not claim to be, my own knowledge of the subject having been gained chiefly during the last six months in the leisure moments I have had at my disposal, while actively engaged in my regular work. Having so recently passed through the primary department, I suppose I can give good advice to a beginner.

The object which I have in view this evening is to give the principles on which the art depends, with some of the chief uses to which it can be applied, which, I hope, will be instructive or interesting to all, and at the same time to give such practical suggestions and formulæ as will be of value to any one who desires to learn to take photographs.

My own knowledge on the subject has been gotten from books, experiments and talks with other amateurs, having learned but little from the regular profession, who, to a greater or less extent, regard it as a secret trade where all information should be paid for. A beginner would probably save time and money by taking a few lessons in a good photographic establishment. That you may understand the change brought about by the introduction of the gelatino-bromide dry plates, which have only been on the market for a few years, some statement of the principles on which photography depends is necessary.

No engineer who has been successively tanned and bleached by field and office work, need be told of the power of the sun to greatly modify the color of many substances. The salts of silver are those mostly used, being the only ones known to be capable of use in the camera, while the compounds of iron and chromium are extensively used in sun printing. Silver chloride, iodide and bromide are the salts used, the action of light being nearly the same on each. If light is allowed to fall on the chloride, under favorable conditions, it is reduced to the subchloride. As is well known, it is the short vibrations of light which so synchronize with the vibrations of the molecules as to throw off one atom of chlorine while the longer vibrations have no effect. The opposite of this occurs when light falls on the eye, so a photographer, by using blue glass and blue curtains, can admit most of the chemical rays into his studio while excluding much of the heat and blinding light, thus enabling his subject to keep cool and have his eyes wide open. The chemical change is very slight in the silver salt, so that very little energy is necessary, the result depending solely on the vibrations being of the right length, just as the trotting dog may have thrown down a bridge which allowed a four-horse wagon to safely pass over it. Capt. Abney states that chloride of silver may be heated to that point at which it will itself give off chemical rays without being decomposed. The action of light on silver chloride is as follows:

$$2\,AgCl = Ag_2Cl + Cl;$$

this change takes place much more readily if some substance is present to absorb the chlorine; in the presence of moisture we have

$$4AgCl + H_2O = 2Ag_2Cl + HCl + HClO.$$

If silver iodide be used in the presence of free silver nitrate, as in the wet plate process, we have

$$12AgI + 6AgNO_3 + 3H_2O = 6Ag_2I + O + 6AgI + 6HNO_3,$$

the nitrate being capable of absorbing the freed iodine is called a sensitizer. If silver bromide had been used in the above reaction, on account of its greater sensitiveness to light, the following reaction takes place after exposure,

$$4Ag_2Br + 6HNO_3 = 4AgBr + 4AgNO_3 + N_2O_2 + 3H_2O,$$

which, with the aid of the nitrous acid set free, soon destroys the latent image. This accounts for the disappearance of the latent image in the so called tannin dry plates when they are kept after exposure before developing.

With the gelatino-bromide plate the case is quite different, the gelatine acts as a sensitizer, absorbing the liberated bromide without setting free any injurious acid, so that such a plate will keep as well after as before exposure, which seems to be indefinitely if properly made and not allowed to get too hot.

Some manufacturers claim that the plates, like whiskey, improve with age. They probably become more sensitive on account of an increase in the size of the grains of bromide. This property of the gelatino-bromide plates, taken in connection with the fact that they are the most sensitive compound known, make them so superior to all others for engineering purposes that I do not consider it worth while to mention any others, referring you to books on the subject.

Cramer & Norden, of St. Louis, were among the first to manufacture dry plates for the market, in this country, and the Cramer plate is still considered the standard. It is as trustworthy as any, perhaps, but not so sensitive as others I have used. I have not taken a single good instantaneous picture with a Cramer plate. Cramer & Norden dissolved partnership, and the latter is also manufacturing dry plates bearing his name, which one of my friends tells me are the quickest and best in the market. I have used them and the Seed plates, also made in St. Louis, enough to say that both are excellent, but not enough to say which is the better. The best plates I have ever had were from the Crystal Dry Plate Co. of Indianapolis. They were branded instantaneous, and with them I made nearly all my instantaneous views. Other plates which I have got since, were not so good. One of my friends gets best instantaneous results with Eastman's Special, which are so sensitive that I have great difficulty in keeping them from fogging. I don't think it makes much difference which of the above brands a beginner starts with, excepting Cramer, for instantaneous work, and Eastman's Special for ordinary work, either of which would propably not give satisfactory results.

THE LENS.

The lens is the most important thing in the outfit, and while the character of this paper does not admit of a full discussion a few remarks may not be out of place.

Makers should, and usually do, state in describing a lens the size of the objective, the equivalent focal length and the size of the plate covered. Lenses are usually compounded to overcome spherical aberration and other obstacles to making a correct picture, and the equivalent focal length is the distance from the optical center of a compound lens to the ground glass, when the rays striking the objective are parallel. The following equation gives the relation between the conjugate foci of a lens:

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u},$$

Where v is the distance from the optical center to the image, u the distance to the object, and f the equivalent focal length, it is evident that if u is infinite $v = f$. If the image is to be $\frac{1}{n}$ the size of the object we have:

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{n\,v} \text{ or } v = \frac{f(n+1)}{n}$$

The quickness of a lens depends on the size of the objective and the shortness of the equivalent focal length. If r is the radius of the lens and f the focal length, then the time of exposure is given by the equation:

$$t = C\frac{r^2}{f}$$

where C is independent of the lens, depending on the value of the light and the quickness of the plates. By means of this equation the quickness of the different lenses can be readily compared.

The standard lenses are those made by Morrison, Voigtlander, Darlot or Dallmeyer, each of whom makes excellent lenses. The Morrison is an American lens, while the others are not. In 1840 Voigtland & Son made the first successful portrait lens ever constructed; they have ever since acknowledged no superior, and their euryscope seems to be the favorite lens in America to-day.

For an engineer, especially if he be economically inclined, I recommend, to cover a 5 × 8 plate, Darlot's Rapid Hemispherical No. 1, $15. When used without a diaphragm, or "stop," it does not quite cover the plate uniformly, but with one of the smaller stops does so perfectly. It is a quick lens and embraces an angle of about 65 degrees.

Morrison's Wide Angle View Lens, No. 4, $25, is an excellent lens, especially for work in confined situations, as in photographing street scenes, machinery, etc.

I have an euryscope No. 2, $52, which works well and will cover an 8 × 10 plate if need be. It is not so well worth $52 as my Darlot is worth $15.

Morrison's New Rapid Copying Lens, $40, covering a 5 × 8 plate, is probably as good as any.

THE CAMERA BOX.

The camera box which I have is made by Anthony, and is called "The Novel." I selected it after looking at all I could see in the St. Louis supply stores, and, taking its cheapness into consideration, is probably as well suited to an engineer as any. The important points are that the plate can be used with its longest dimension either vertical or horizontal, that it can be turned about a horizontal axle so as to make the plane of the picture vertical when the camera is pointed up or down, and that the lens should be capable of being moved vertically.

The tripod should be light and portable, folding up so that it can be easily carried.

DRY PLATE HOLDERS.

Of these there are a great variety, but by far the most convenient for an engineer are the paper holders which add very little either in bulk or weight, making them suitable for field work. They are patented, not very well made, and sold high, because one cannot get along well without them.

TIME OF EXPOSURE.

The question of how long to make the exposure is the most difficult one connected with photography, since it depends on so many things, such as the lens, the diaphragm, the quantity and quality of the light and the color of the object. The time varies from the instantaneous, when the object is white and in bright sun light, to hours in enlarging or in photographing microscopic objects.

To give a beginner some idea if he wishes to photograph a landscape with a Darlot lens, medium size stop and in the bright sunlight, two seconds will suffice, while I have never succeeded in taking a portrait in an ordinary room with less than 30 seconds exposure when no stop is used. A good way is to expose different parts of the same plate unequally, then notice which exposure gives the best result. The only way to learn is by experiment, and after spoiling many plates the learner will know by intuition how long to keep the cap off. A professional hardly ever looks at his

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watch, though a beginner should not only observe the time, but should record it.

DEVELOPMENT.

In most processes, and especially in the gelatino-bromide, the latent image is practically invisible, necessitating the use of a developer, whose use depends on the fact that after one atom of silver is precipitated it attracts other atoms as they are thrown down.

The developer first attacks the sub-bromide, shaking off one atom of silver which aids in the precipitation of others, the bromide being absorbed by the developer. The reduction of the silver bromide which has not been effected by light probably takes place according to the formula:

$$Ag + AgBr = Ag_2Br.$$

The so-called iron developer is, all things considered, undoubtedly the best for an engineer, on account of its cleanliness, convenience, and the control it gives in developing plates improperly exposed. The following is one I use with much satisfaction:

Solution No. 1.	Neutral oxalate of potash	5 ounces
	Bromide of ammonia	30 grains
	Water	20 ounces
Solution No. 2.	Photosulphate of iron	5 ounces
	Tartaric acid	20 grains
	Water	20 ounces

To four parts of No. 1 add one part of No. 2; place the plate in the tray and dash the developer over it, wetting the whole plate as nearly simultaneously as possible. For a 5 × 8 plate use 2 ounces of No. 1 and 4 drachms of No. 2. To develop an instantaneously exposed plate increase the amount of iron to about 5 drachms, add a few drops of bromide of ammonia from a solution of ten grains to the ounce; dash the developer over the plate, and as soon as it is wet pour it off; add three drops hyposulphite of soda, then pour it back into the tray, after which the picture will come out very rapidly.

The Cramer developer is by many photographers considered the best, and for economy and excellence of the negatives produced by its use is certainly a very good one. It stains the fingers, and small bubbles form readily in it, like soapsuds, which are liable to stick to the plate and cause spots. It is not so good for developing instantaneous work.

The following is the formula for preparing it.

Stock Solution.

Sulphite of soda (crystals)	3 ounces Troy weight
* Bromide of ammonium	½ or 1 ounce " "
Bromide of potassium	1 ounce " "
Pyrogallic acid	2 ounces " "
Dissolve thoroughly in pure rain, distilled or ice water	32 fluid ounces.
Add sulphuric acid, c. p.	120 minims.
Concentrated liquid ammonia. 26° B. (sp. gr. 0.900.)	3 fluid ounces.
And water to make up bulk to	40 ounces.

*If you prefer intense negatives, use 1 ounce bromide of ammonium, but if you prefer soft negatives, ½ ounce will be best and will allow shorter exposure.

Dilute sufficient for one day's use in the proportion of 1 part stock solution to 11 parts of water. Use a rubber stopper for the stock solution.

FIXING.

After development the negative is washed and put into the fixing bath which is prepared by dissolving one pound of hyposulphite of soda in a half gallon of water. In warm weather an addition of alum is beneficial. The hyposulphite dissolves the unaffected salts of silver. After fixing wash thoroughly.

Gelatine negatives frequently need intensifying, for which purpose I use England's mercuric intensifier.

Mercuric chloride	1 part.
Ammonic chloride	1 "
Water	20 to 24 parts.

Pour the intensifier over the negative and rock the tray until the picture turns white; then wash thoroughly, after which put it in water containing a small quantity of ammonia, which turns it black.

As a rule for engineering purposes the negatives do not need either retouching or varnishing.

SILVER PRINTING.

The art of silver printing is an old one and to-day does not differ greatly from that described by Fox Talbot in a paper read before the Royal Society in January, 1839.

Not much, therefore, need be said on the subject, the most important thing being the list of necessary articles given at the end of this paper. A few remarks concerning my methods may not be out of place.

The silver bath which I use is the following:

	Ounces.
Silver nitrate	2
Water	16

Considerable latitude is allowable in the proportions, but the quantity of silver should never fall below 45 grains to the ounce. Float the albumenized paper on the bath for two minutes. In putting the paper on the bath, let the middle of the albumenized side touch first, then press down the edges, breathing on the back of the paper if the edges start to curl up. Keep a basin of water at hand so that any of the bath which may get on the fingers may be washed off immediately, in which case it will not stain them. When the paper has floated long enough raise one corner with a glass rod, catch it with a clothes-pin and hang it on a string to dry, attaching a small bit of blotting paper to the lower corner to catch the drop. When dry roll the paper on a stick with the sensitive side out to straighten it. Then cut the paper to the proper size and store it between sheets of blotting paper which have been saturated with a solution of bicarbonate of soda and dried. In this way sensitive paper may be kept for a week or two.

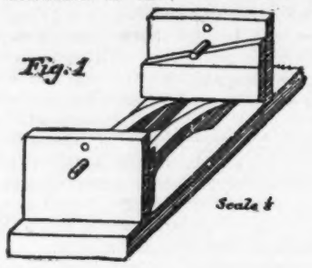
Before printing the paper is put into a box with a lid and fumed for ten minutes. Print usually by direct sunlight until the print is darker than the finished photograph is desired. Trim them by cutting around the edge of a trimming glass. I got the trimming glasses cut at a glass store, and smoothed the edges with sandpaper, which makes them cost but little. After trimming wash the prints well; then tone them, for which purpose I find the following bath to work well:

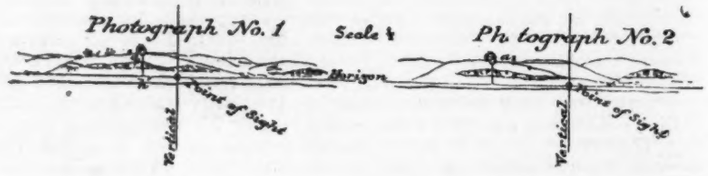
Tri-chloride of gold	1 grain.
Carbonate of soda	10 grains.
Water	10 ounces

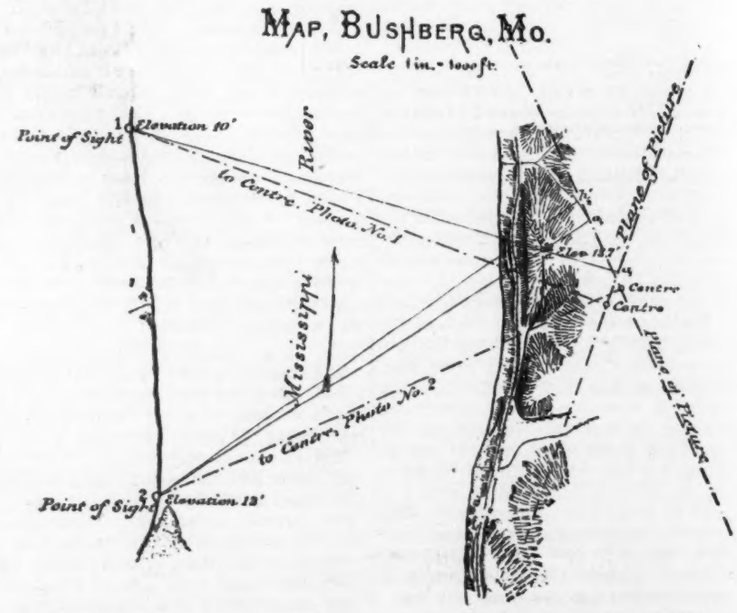
Dissolve the 15 grains of gold, which comes in a small bottle, in 15 drachms of water, and in preparing the above bath pour out one drachm of the solution. The bath should be used immediately and works quicker if heated to 100 or 120 degrees Fahr. Keep the old bath, adding fresh chemicals each time before using.

After toning, fix the prints with:

Hyposulphite of soda	1 pound.
Ammonia	2 drachms.
Water	½ gallon.







N. B. The distance ab (12.5) is the elevation of the point a above station 2

Leave them in this bath for about ten minutes, then wash thoroughly. I usually leave them in water over night, with the water running slightly part of the time, after which I wash each one thoroughly as I take it out. Partly dry the prints with blotting paper and mount them with "Parlor Paste." The arrangement which I devised to keep them from curling up when drying is shown in Fig. 1.

The albumenized paper contains sodium chloride, which is changed by the bath to silver chloride, some free nitrate remaining on the paper. After printing the picture consists of silver, silver subchloride, and silver albumenate. In toning gold is substituted for part of the silver, possibly in the following way.

$$3Ag_2^{\cdot}Cl + AuCl_3 = 6AgCl + Au.$$

OUTFIT.

The articles which a beginner will need for taking photographs 5 × 8 are:

For Taking and Developing the Negative.

1 Darlot lens, No. 1	$15.00
1 Camera box	20.00
1 Tripod	2.50
1 Frame for paper holders	2.00
½ Dozen paper dry plate holders	2.50
1 Gossamer focusing cloth	1.00
1 Ruby lantern	2.75
3 Japanned iron trays, 5 × 8	.75
1 4-ounce measuring glass	.35
1 Nest of 3 beaker glasses, 2 to 4 ounces	.45
3 20-ounce glass bottles	.30
1 ½ gallon glass bottle	.15
2 4-ounce wide mouthed glass bottles	.40
1 Glass stirring rod	.10
1 Glass funnel	.20
1 10-ounce bottle for intensifier	.10
2 Camel's hair brushes	.20
1 "Granite ware" washstand set	5.75
1 pound Neutral oxalate of potash	.50
1 pound Photosulphate of iron	.06
5 pounds Hyposulphite of soda	.25
1 dozen Dry plates	1.75
2 ounces Bichloride of mercury	.25
2 ounces Chloride of ammonia	.30
6 ounces Retouching varnish	.50
1 box Calcined flour (Bigelow's)	.35
Total	$38.46

Silver Printing.

1 Porcelain tray, 10 × 12	$1.20
1 Argentometer	.60
1 Thermometer	1.00
1 pair Scales	1.00
1 20-ounce Bottle, glass stopper, for silver bath	.25
1 16-ounce Bottle, for old toning bath	.10
1 1¼-ounce Bottle, for chloride of gold	
1 Fuming box (any old box will do)	0.00
4 Printing frames	2.60
3 Trimming glasses 3.8 × 6.1, 5.8 × 7.65 and 4.4 × 7.33	.40
2 Iron pans, "granite ware," for toning and fixing	.40
1 Glass funnel	.25
1 Flat brush, for pasting	.25
1 Sponge	.25
1 1-drachm Measuring glass	.25
2 ounces Nitrate of silver	1.70
1 dozen sheets Albumenized paper	.90
15 grains Chloride of gold	.60
¼ pound Carbonate of soda	.05
1 pint stronger Ammonia water	.40
1 pint white Parlor paste	.25
½ dozen sheets Blotting paper	.40
¼ pound Absorbent cotton	.35
50 Cabinet mounts	.50
25 Panel mounts	.60
100 mounts 5 × 8 cut to order	1.00
Total	$15.41
Add total for negatives	58.46
Total cost of outfit	$73.87

This is as cheap an outfit as I will recommend for satisfactory results on a 5 × 8 plate. Not including the cost of my surveying camera I suppose I have spent over $200, which includes a $52 lens and some material for sundry experiments.

APPLICATIONS.

The following are some of the uses to which the art can be put by an engineer:

In visiting engineering works completed or under construction, much has frequently to be learned in a short time. A few photographs of the general plan, interesting details and machinery used in construction, showing methods of doing work, would be of incalculable value. The advantage in an engineer's being able to take the views himself instead of buying them, consists in his being able to get just what he wants without being bothered with that which can be of no value to him. Besides it will frequently happen that there is no professional photographer near.

If an engineer is in charge of construction and wishes to report progress either to a chief or board of directors, a photograph is the most accurate and trustworthy method of showing the exact condition of the work. In this case a boy could easily be taught to do the drudgery connected with developing and printing.

In case of accident to railway property, such as a washout or land-slide, a wreck caused by collision, fallen bridge, tornado, earthquake or otherwise, a photograph is the quickest way of reporting the extent of damage and condition of the wreck.

Drawings can be quickly photographed and reduced in this manner to a small scale, and made of uniform size, so that they will occupy but little room and still all the details be sufficiently well preserved to make working drawings from them if necessary. These photographs are also exceedingly convenient for an engineer who is superintending the building of machinery, saving him the bother of carrying a large drawing.

Blue prints can, of course, be made from negatives as readily as from tracings, and for many purposes are preferable to silver prints.

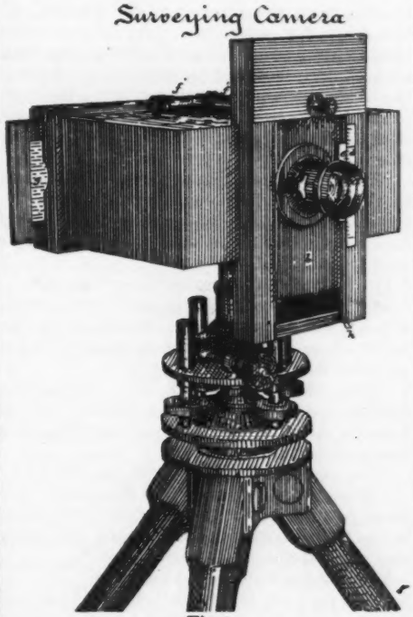


Fig. 2.

If a blue print be made of a machine or other object, and a pen and ink drawing be made on top of it, the blue may be afterward washed out or destroyed by immersing the picture in a saturated solution of bicarbonate of soda, which in about a minute causes the blue to disappear, leaving only the black ink lines on a white ground. Wash it carefully in water and dry; after which it may be photo-engraved and set up with ordinary type in printing a catalogue, or elsewhere. The best ink I have ever found for the purpose is "Higgins' American Drawing Ink" ("waterproof.") The Moss Engraving Company, of New York, use silver prints and wash out with cyanide of potassium, which is obviously inferior to the above method, which I have never seen described, and it may be new.

If autolithographic ink be used instead of Higgins' the drawing can be transferred immediately to the stone without washing out the blue. The accompanying view of my surveying camera was made in this way. For this work paper prepared for autolithography should be used.

A negative can be taken from a tracing or drawing on thin paper directly by contact instead of using the camera, prints taken from it giving black lines on a white ground in silver printing, or blue lines on a white ground in blue printing. For a large drawing the negative and chemicals of developing would be expensive.

SURVEYING WITH THE CAMERA.

This being a strictly engineering use of photography, and having been but little used, if at all, in this country, and not much any where, is perhaps the most interesting to those present or who will read this paper. I will, therefore, now give a description of the surveying camera which I have had made for experimental work next summer in connection with the United States survey of the Missouri River; also the general principles and methods of application, reserving the details for another paper, which, if you desire it, I will read at some future time, when I hope to know more about the subject.

In this work the dry plate must of course exactly take the place of the ground glass used in focusing, both of which are in the plane of the picture. It is obvious this plane must be made accurately vertical, so that all vertical lines may appear so in the photograph, and that all objects may be projected on the horizon by parallel lines. That the horizon may be accurately determined some line, as the one through the center of the ground glass, must be capable of being made truely horizontal. To accomplish both these ends the small levels, shown at f and f in Fig. 2, are placed on top of the camera box, the one being horizontal and parallel to the ground glass, the other perpendicular to it. The back of the box must be rigid and the focusing done by moving the lens, which is easily accomplished, since for distant objects but little change is necessary. The dry plates should, on the score of economy and convenience, be long and narrow, those I use being 2½ × 8.

The lens should be so fixed that it can be moved up or down, for taking bluffs or mountains above the point of sight, or valleys below it.

To accomplish this the lens a is attached to a slide b, moving vertically. A clamp screw is shown at c. The slide carries a vernier e which in connection with the fixed scale d shows how far the lens has been moved. The zero of the scale is determined by bringing the lens to the point where objects in the horizon are projected on the horizontal line through the center of the ground glass. The slide b is held against the front of the camera box by brass springs, one of which is under the clamp c and the end of another is shown at h. The ground glass for focusing is shown at g, partly withdrawn.

The distance from the optical center of the lens to the ground glass is accurately determined by measuring a base line in front of the camera, measuring the distance of the base line, and the length of the image or distance between the extremities as shown on the ground glass. Any change in the focal distance is measured by a scale on the side of the lens, not shown in the drawing. One of the smaller stops should be used to sharpen up the picture.

If photographs be taken with the surveying camera from two known stations, and the direction of the point of sight be measured with a transit or by means of a compass attached to the camera, the position of each object which can be seen in two pictures can be determined on the map both horizontally and vertically. The method of placing the photographs in position and locating objects is, I think, so well shown in the accompanying map that it need not be described here.

The map is part of an experimental survey I have just made at Bushberg, 25 miles below St. Louis, on the Mississippi River. The draughtsman should work directly from negatives on account of the greater accuracy and distinctness of detail. The accuracy of the gelatine film on glass is so great that Dr. Eder was not able to discover any change, from developing and fixing, although by the method used he could have detected a variation of $\frac{1}{3000}$ in the distance.

By this method of surveying the plane table is virtually brought into the office, and the

topographer is at both stations simultaneously without being bothered by sun or wind.

The chief difficulty arises from aerial perspective, or the fact that distant objects appear as masses, it being hard to distinguish details. The photograph should therefore be takenwhen the air has little smoke or haze in it, and if possible when the sun shines on the back of the instrument. For nearly inaccessible mountain regions, where the air is so clear that distant objects appear very close, I think the surveying camera will be invaluable. Its peculiar adaptation to military purposes, where it is important to reduce the time of the field work, need not be pointed out.

Besides the above use of photography there are many critical moments arising in engineering practice as where Capt. Abney, Corps of Royal Engineers, tested the value of torpedoes by instantaneously photographing the column of water thrown up by the explosion.

The most wonderful achievement in photography is perhaps that of M. Marey, a French savant, who has successfully photographed a flying bird by the use of a photographic revolver in the form of a fowling piece aimed at the bird. Twelve pictures were taken successively, each being exposed $\frac{1}{720}$ of a second, gelatino-bromide plates being used which were capable of taking pictures with an exposure of $\frac{1}{1500}$ of a second. By putting the pictures in a phenakistiscope of Plateau the flying of a bird could be observed.

The following books may be recommended in the order given. "Photographic Amateur," by J. Traill Taylor, New York, Scoville Manufacturing Co., 50 cents. "A Treatise on Photography," by W. de Wiveleslie Abney, New York, D. Appleton & Co., $1.50, belonging to the "Text-books of Science." "Modern Dry Plates," by Dr. J. M. Eder, and "Silver Printing," by H. P. Robinson and Capt. Abney. New York, E. & H. T. Anthony & Co., 1881, 75 cents each. "The Chemical Effects of Light and Photography," by Dr. Hermann Vogel. New York, D. Appleton & Co. "International Scientific Series," $2.

The Outlook in Brazil.

RIO DE JANEIRO, April 5.—The present state of affairs in Brazil is critical in the highest degree, and the final collapse, apparently, is not far distant. Although the country has been steadily drifting toward this crisis for many years, and has even been suffering from it during the last two or three years, the crash has been kept off and the country allowed to drift on toward inevitable bankruptcy. Every effort to call attention to the danger has, until recently, been talked down as pessimism and enmity. Every indication of waning industry or financial difficulty has been ascribed to temporary causes, like the Paraguayan war, or abolition, or short crops. Whatever the difficulties or their necessities, the Brazilian people have been fatally blind both as to the real causes and their ultimate results. They have pinned their faith to the belief that the natural elements of wealth and prosperity in this country will in some way bring them through safely, and so they have been quite content to drift with the tide. In all emergencies England has supplied them with money, and English speculators have promptly united to preserve their credit. To-day, however, the circumstances are somewhat changed. The last loan has not been taken up like its predecessors. Brazilian finances have been severely criticised in London, and Brazilian credit has suffered a reverse. More than that, an internal loan cannot now be placed, and for the first time in many years the Brazilian government is made to feel the pains and penalties of its extravagance and maladministration.—*Bradstreets.*

ENGINEERING NEWS: Three months for One Dollar.

Surveyor's Camp Fire Yarns.

"Why, we let them down by ropes, of course."

The speaker was a broad-shouldered, bright-eyed fellow about 30 years of age. His clear cut features were bronzed and reddened by exposure. Around him were gathered a crowd of young men whose dress and conversation proved them to be unmistakably subjects of Her Brittanic Majesty. This group constituted the surveying party laying out the line of the Credit Valley Division of the Canadian Pacific Railroad entering Windsor.

The boys, numbering 30, were enjoying a quiet smoke on the broad piazza of the British American overlooking the river, and were grouped around in different posture enjoying the quiet of the evening after their day's labor, some puffing their cigars, others pulling away at long clay pipes.

The speaker, and central figure of the party proved to be an old surveyor who had done service from the Atlantic to the Pacific. As the *Journalier* joined the party he was entertaining his less experienced companions with an account of some of his exploits throughout the western country, causing at times the most decided expressions of incredulity to spread over the faces of some of the tenderfoots of the company.

"Why, after spending a few months at work in the Rockies," he continued, "a man becomes as accustomed to dangling at the end of a rope over a precipice 300 to 500 feet high as eating his dinner."

The hair of the tenderfoot stood on end.

Said a pale faced, slightly built youth, whose appearance suggested him belonging to the latter class. "Where do you manage to put up when in such a wild country?"

"Why, bless you, my boy, when running the Canada Pacific through the Rockies for 18 months none of us ever had anything but canvas over our heads."

"Oh, come, now, how about the winter?"

"Winter and summer just the same. I'll show you letters dated Porcupine Hill, a spur of the Rockies, written in February, with snow any number of feet deep around us."

Young John Bull looked amazed.

"You may not believe it," chimed in an old timer, "but for four years I never wore a pair of shoes—that is, nothing but moccasins—and my feet became so hard I could walk barefooted through a bush for miles."

For the edification of the *Journalier* the first speaker related a few facts concerning the hardships and privations through which the sturdy pioneers of the iron horse are called upon to pass.

"A party of 10 men may start from, say Winnepeg. Tents and supplies for six months are carried in carts drawn by mules, each man in charge of his own rig. They make perhaps 30 miles a day, until they reach the point of operation. Should the work be over prairie land, six miles is a good day's work, and a camp is moved every second day. A long stretch of prairie means a sadly monotonous life, and should the country prove to be a marshy one, wading through sloughs and fighting mosquitoes, renders it a very unpleasant one. Work is commenced at sunrise and lasts as long as there is light."

"I suppose the boys sometimes try to forget the hardships of the day by looking in the flowing bowl at night?"

"It ain't because they wouldn't like to, you can rest assured. The fact is, however, that parties are allowed not over two gallons of liquor to be used for medicinal purposes, and are not permitted to carry any more with them. It usually lasts well, say—the first night out, followed by a dozen swelled heads the next morning. After that the boys lead exemplary lives of total abstinence, unless good luck should draw some traders across their route. The monotony of prairie life is changed when the company strike a mountain region. The carts are then abandoned and the supplies are packed on the mules, the weight carried by each averaging 300 pounds. While the work is harder, the change of scene, and perhaps the romantic surroundings, renders it more interesting. Then, again the dangerous features of mountain work tends to supply a stimulus in the way of excitement."

"Explain."

"Well, canyons are encountered hundreds of feet deep, perfectly perpendicular, and extending for miles. Some of these can not be avoided and have to be crossed. At times the course is such that the work can be accomplished by sending one picket man across, the rest of the party making a circuit. This man is lowered over the immense cliff with ropes, and left to make his way up the opposite side as best he can. Of course a railroad, as a rule, follows the course of some stream, and the deepest ravines are thus avoided."

"Distances in mountainous regions are, I presume, deceptive?"

"Indeed they are. One of the fellows in our Pacific corps, a young Englishman just over, was seen to start out early one morning with his gun over his shoulder. He showed up in the middle of the day in a dazed condition. In answer to inquiries, he remarked, 'This is a blawsted country, this of yours; why I thought I would run up the mountain and take a shot at some of those pretty mountain sheep you were telling me about. The faster I walked the further the blawsted rocks appeared to be, so I trotted back to camp to find out about it, you know.' You can imagine his surprise when he was told the 'rocks' were 200 miles away."

"Are Indians troublesome to Western survey parties?" asked the reporter.

"As a rule they are not. They may steal a mule or so if the opportunity presents itself. The only skirmish I have experienced was a brush with a party of Blackfeet in June of 1883. We were doing some Government work up in the Blackfeet Reservation, and in some way the Indians got the idea our object was to take away their land. They followed us and pulled up our work as fast as we laid it out, stole mules, horses and everything they could lay their hands on. Finally Government agents interviewed the chiefs, and the matter was amicably settled."

"How do you stake out your work when surveyed?"

"In prairie land we drive in iron pipe and build a mound of earth around it. In the woods and mountains wooden posts mark the line of survey."

"Do you ever run short of provisions?"

Here another old timer broke in: "Well, I should gently remark. Why, I ran a party of 30 men in the Northern country some years ago for three months on nothing but flour and water. Any man of us would have walked 50 miles for a piece of pork rind."—*Detroit Evening Journal.*

MANCHESTER SHIP CANAL.—The preamble of the Manchester Ship Canal Bill was passed by the Select Committee of the House of Lords, on condition that the scheme should not be carried out until £5,000,000 capital had been raised. So active were the supporters of the Bill, that within three hours of the above decision having been known the whole amount had been raised. The proceedings connected with the Bill have occupied forty-one days, and the costs are said to amount to £160,000.

CELINA, OHIO, June 6.—The surveyors of the Columbus and Fort Wayne Railroad arrived here to-day en route to Fort Wayne.

Clay vs. Iron Pipe for Sewer Connections.

A number of plumbers and drain-pipe manufacturers waited upon Commissioner Raymond, President of the Brooklyn Board of Health, on the 22nd of May, to argue the advantages of clay over iron pipe for house and sewer connections. A strong fight between the iron and clay industries, says the *World*, has been going on for the past three or four years, and, owing to adverse legislation and enactments by the health department of this city and Brooklyn, the clay-pipe men have been nearly starved out of business. In 1881, a rule was adopted by the departments of the two cities that all plumbing material in houses for the carrying off of waste water should be of iron. The clay manufacturers claim that the rule is unconstitutional and unfair, and this view has been entertained by many property holders and manufacturers who are compelled to renew their plumbing every few years in consequence of the action of acid or gas employed in their business upon the iron pipes. In 1883, a committee of gentlemen interested, succeeded in bringing the matter before the Legislature, and an amendment was passed prohibiting the health boards from dictating in the matter. When it went before the Governor, Dr. Chandler, of the New York Health Board, opposed the bill and it was not signed, It was learned that the doctor's own house was plumbed with clay pipe, which he was compelled to use in consequence of the acids employed by him in his profession, which would destroy iron pipe in a short time.

The Brooklyn manufacturers applied to Commissioner Raymond and to Mayor Low for the amendment of this rule of the department. Under their direction a number of experimental tests were made of the relative merits of iron and clay pipe. The vitrified clay pipe was subjected to tests far more severe than the common sewer pressure under any circumstances, and it was found to withstand the strain. A similar application was made to the board of this city by a committee of manufacturers representing $5,000,000 capital, but no attention was paid to their demands.

Mr. George T. Walker acted as counsel for the clay manufacturers. Mr. Abraham Mead, chairman of the Executive Committee of the Master Plumbers' Association of the United States, extolled the merits of vitrified earth pipe in a long speech. He said that in 1872 he saw pipe in Pompeiian excavations which had been laid many centuries ago, and it was in as good condition as when it was laid. "The question is, have we as good material for making it now as they had? I think we have. I have seen pipe unearthed in New York City where it had lain for 30 years, and it was apparently as good as new." The discussion then turned to the action of acids or chemicals on drain-pipes, as in the case of stables and factories. The gentleman claimed that clay pipe is practically impervious to the action of acids.

Mr. Raymond announced his decision as follows: "Gentlemen, I am satisfied that we cannot settle this question finally until I see a house plumbed in its sewer connections with earth pipe, and am satisfied of the perfect operation of that plumbing from a sanitary standpoint. Our action on this matter will be reviewed and criticised by the health boards of the various cities. I will, therefore, give you permission to insert your pipe in one house wherever it may be chosen by yourselves, and the results will be reported to me by the sanitary engineer. If they show that your pipe stands the test in every way, I will modify the rules. I feel the responsibility resting upon me, and am satisfied that the pipe made today is quite different from the old 'flower-pot' article." This decision was considered entirely satisfactory to all concerned.

Sewage on the Fields.

The Question of Epuration of Sewage Discussed Before the Suffolk Medical Society.

The Suffolk, Mass. District Medical Society held an adjourned meeting recently to continue their discussion of "Sewage Systems and the Epuration of Sewage by Irrigation and Agriculture." Dr. R. T. Edes presided. Eliot C. Clarke, C. E., opened the discussion with a description of a sewage farm at Pullman, Ill. The farm there had proved a greater success than in any other place that the speaker had heard of. The climate there was about the same as here, and therefore it would seem that if the system was a success there, it would also be a success here. They cultivate about 140 acres with 200,000 gallons sewage per day; on that scale the sewage here would supply 15,000 acres, an area equal to the whole city of Boston. The sewage alone is not a manure in the way that barn-yard manure is, but has to be used alternately with manure.

A large number of questions were asked by members present, and short responses were made by Dr. W. H. Faxon of Quincy, Prof. Sedgwick and others, after which Dr. Henry J. Barnes delivered an address, supplementary to his address at the first meeting. Dr. Barnes first alluded to the opposition to the system of epuration. Said he: The unprofitable results of sewage farming have been dwelt upon by most of the opponents of the system who forget that it is a question of sanitation and not of making money, and, moreover, if raising vegetables contributes in any degree to lessening expenses, it takes precedence in a financial point of view over all others, as they make no return for the original outlay except the almost universal offenses they create.

The enormous dilution of sewage in this country has been raised as an objection, but by analysis the amount of organic matter in the sewage of American and European cities has been found to vary but little. As to the impossibility of suitable soil of sufficient area in Massachusetts for the general employment of this system, the success which has attended the efforts of the English in finding it in their thickly populated island is an answer. Our forests could be utilized with little expense. I only ask that this system may be tried on a limited scale in Massachusetts by some one having faith in its success, that we may not make the mistake of London, Brighton, Torquay and Dantzic by building a Metropolitan sewer from Natick to discharge in deep water, for the success of this system here might ultimately necessitate reversing the current of the sewage of the Metropolitan district. A large proportion of our rural population have gardens attached to their homes. I would discourage the use of cesspools, and recommend the use of these lands for disposing of sink water. Science, after long experimenting, now knows that the most fertilizing and effective of manures is that of man.

A great city is the most powerful of stercovaries. To employ the city to enrich the plains would be a sure success. But the filth is swept into the abyss. All the human and animal manure which the world loses, restored to the land instead of being thrown into the water would suffice to nourish the world. These heaps of garbage at the corners of the stone blocks, these tumbrils of mire jolting the streets at night, these horrid scavengers' carts, these fetid streams of subterranean slime which the pavement hides, what is all this? It is the flourishing meadow, the green grass, the thyme and sage; it is game, it is cattle, hay, corn, bread upon the table, warm blood in the veins. It is the very substance of the people which is carried away by the wretched vomiting of our sewers in the rivers and into the ocean. From this come two results—the land impoverished and the water infected. A system of elementary drainage as simple as the lungs of a man, and which is already in full operation in several English villages, would suffice to bring into our cities the pure water of the fields and send back into our fields the rich water of the cities. And this easy see-saw method, the simplest in the world, would retain in our possession the hundred millions thrown away. The present system does harm in endeavoring to do good.

Metropolitan Water Supply.

The following communication from Mr. A. Le Grand, of the Magda a Works, 100 Bunghill Row, E.C., is in reference to a paper by Dr. Percy Frankland, which was read at the Society of Arts:—

From what has transpired in the course of the discussion upon Dr. Frankland's important paper, it would almost appear as though some hold it a condition precedent that water should, as a preliminary stage, be diluted with sewage in order to be subsequenly purified by either natural or artificial processes, while others considers that nothing but deep well water is safe to drink; but from whatever source it may be obtained, the common sense desire must be to keep all possible pollution away from it; in other words, if we are compelled to travel along a dangerous road, instead of trying to see how near we can drive to precipices with safety, we should give them the widest berth possible.

I happen to have sunk some hundreds of tube-wells along the banks of the Thames, between Windsor and Gravesend, and have thus become acquainted with the water obtained. Many people are under the impression that because a well is sunk near a river the water drawn from it must of necessity come from the river; whereas, under certain commonly existing conditions, such as a porous subsoil in communication with the adjacent higher ground, the conclusion arrived at is erroneous.

I have met with numerous instances where the present water has been obtained at no great depth, close alongside the Thames, the foulness of which latter as it flowed by needing no analysis to prove it. The fact is, instead of the river supplying the wells in question, the very converse of this frequently is taking place, springs from higher elevations flowing steadily into the river, and thus, in sinking the wells in question, you are simply intercepting the springs which go to swell the volume of the river. I would, therefore, here remark that the analysis of samples of water drawn from the river at various points may lead to erroneous conclusions, if any of the samples in question happen to be taken at spots where these unseen tributaries of pure water are flowing with considerable strength into the river, and thus largely diluting its foul water.

The foregoing facts further point out that, if we are obliged to take the bulk of the London water supply from river sources, it would be far better to intercept the clean underground springs flowing into the Thames, than to take the water after it has been mixed with the many pollutions to which the stream is so liable. The adoption of such a course, while not only securing greater initial purity, would largely, if not entirely, do away with the work of filtration. An experiment in this direction was made upon a somewhat large scale about two years since, at Shrewsbury, where the river is polluted and turbid. Fifteen 3-in. tube-wells, about 22 ft. deep, were driven upon a small island, which is at times covered with water; these were connected to one receiver, or main, about a hundred yards long, and yielded a supply of about three-quarters of a million gallons per diem. The quality of this water was rather harder than that of the river, but otherwise it was not only perfectly clear but remarkably pure.

Referring to the theory of purification by atmospheric influence, the following circumstance which came under my notice a few years back, may be of interest as bearing upon the subject. The water from a more or less polluted river formed the supply of an important town in the north of England, and samples drawn direct from the stream were from time to time sent up to London to be tested by a well-known analyst, so that he was quite familiar with its characteristics. Upon one occasion the engineer caused the water, as drawn from the river, to be forced up into the air in a jet, and falling in a spray was caught and a bottle of it sent up to the analyst. So great was the change effected by this simple process in the direction of purity, that the analyst was with difficulty convinced there had not been a mistake made as to the source from whence the sample was derived.

Dr. Frankland mentions the deep well-water supplies of several towns near the river, and I must say, from my experience of a large number of artesian tube-wells I have sunk in the London basin, ranging from 150 ft. to nearly 500 ft. deep, the water so obtained is extremely pure and wholesome, and there can be no doubt whatever that such sources (where proper care is taken to exclude surface drainage, to which dug wells are liable) are the most reliable for purity; still, as the case of Ballard *vs* Tomlinson goes to show, ignorance or carelessness may jeopardise such a source, though incidentally I may observe, from an intimate acquaintance with all the facts of this particular case; they have perhaps been magnified much beyond its actual merits; not so, however, with regard to its bearing upon the whole question of the pollution of underground sources of water, which is a subject that unquesionably demands the urgent attention of sanitarians with a view to effective legislation.

It may hardly be generally realized, but it is none the less certain, that deep cesspools are daily being sunk, as the readiest, but none the less most improper, means of getting rid of sewage, not only for isolated dwellings but in populous districts. In some cases these cesspools are dug 50 or 60 ft. deep, and in others borings are actually made to considerably greater depths for the same object, and I have more than once drawn the attention of the local Government Board to this practice, which is fraught with much danger to the community at large.—*The Architect.*

Mysteries of North American Lakes.

"Cayuga Lake has also a mysterious tidal motion. It is irregular in its occurrence, but very decided. The phenomenon has been known to appear twice a year, and then two years or more have elapsed between its periods. The water frequently recedes 50 ft. The ebb is gradual, but the flood tide comes in with considerable force and rapidity. This phenomenon is also noticed on Seneca Lake, which is divided from Cayuga by the high Seneca county hills. The surface of Seneca Lake is 60 ft. above that of Cayuga Lake, but I believe its bed is of the same remarkable character. Seneca Lake rises and falls as much as 3 ft. during the time of its tidal commotion, which is also irregular in its periods.

"I believe there is a subterranean river running from Lake Superior, through Lakes Huron and Michigan, under Lake Erie, and emptying into Lake Ontario. There is no other way in which to explain certain mysteries connected with our great lakes. The surface of Lake Superior is about 650 ft. above tide, while its bed is 260 ft. below tide level. Lake Huron's surface is 50 ft. below that of Superior's and its bed is about on a level with Superior's. The surface of Lake Michigan is 300 ft. lower than Lake Huron's and its bed is sunk a corresponding distance to the level of the other two lakes. Lake Erie's surface is nearly as high as Lake Michigan's, being 565 ft. above tide, but its bed is also above tide, being 350 ft. higher than the ocean level, consequently its bed is 250 ft. higher than those of the lakes above it. Lake Ontario's surface is the lowest of all the great lakes, being less than 500 ft. above tide, but its bed is 260 ft. below the ocean, or about the same level as Michigan, Huron, and Superior. So there is a continuous fall from Lake Superior to Ontario, and all the outlet that the upper lakes have that is known is the comparatively insignificant Detroit River. That stream never can care for all of that great pressure and volume from above, and the theory of an underground river, such as I mentioned, seems to me most reasonable. All the St Lawrence fishes are taken in everyone of the lakes but Lake Erie. Why? Because they follow the course of the subterranean stream, passing 300 ft. beneath the bottom of Lake Erie, and enters the waters of the upper lakes. The great lakes above Lake Erie have an occasional flux and reflux of their waters, corresponding with ocean tides save in regularity.

"The subterranean river, according to my theory, becomes occasionally obstructed by great obstacles that are constantly moving down from the lake bottoms. Then the channels of outlet are insufficient to carry off the great volumme of water,and they are damned back, and the lakes rise. Finally these obstructions are swept away by the irresistible pressure, the river flows naturally once more, and the dammed waters subside. That is the whole mystery of the rise and fall of the tides in the great lakes."—*N. Y. Sun.*

How to Line a Well.

A farmer in Massachusetts, who has had much experience in digging and stoning-up wells, writes: The old way of digging a well and stoning it up so as to leave it about three feet in diameter is a very good one if the water is to be drawn up with buckets; but if only with a pump it is a very poor way, for if, as is the usual custom, the well be covered at the top, it leaves a very large space for dead air, which often becomes so bad that it affects the quality of the water, and also makes it unsafe to enter the well. When a well thus stoned has only a pump in it, the covering should be under water, or very near it; but if it is known that only a pump is to be used, the expense of stoning may be saved and the water kept in a much better condition. This is done by digging the well in a dry time, and when dug as low as possible a cement pipe, some two feet in diameter and two or three feet long, is sunk at the bottom, and worked down as low as possible by digging out the inside. The pipe should be covered over with a flat stone, through the middle of which a two-inch hole has been drilled; directly over this hole stand up drain pipe, then begin to fill in the hole. When filled as high as the top of the first piece of drain-pipe, put on another, being careful to have it straight with the other and the line perpendicular. Continue filling and adding drain-pipe until it is as high as the surrounding ground; or if the pump is not to stand directly over the well, then when it is filled within four feet of the surface put in the pump pipe and lead it off in a trench to where the pump is to stand. When it is found that the pipe is all right, finish filling the well, leaving some durable mark that the position of the well may be known. A well of this kind is reliable and permanent, requiring no repairs; the waters is cool and free from impurities that open wells are subject to; no insects or animals can find their way into it, and the cost is not more than one-half that of a well that is stoned. If dug, as it should be, when the springs are low, a constant supply of water that is as pure as the underground spring is secured. As the well is always full, there is no chance for bad air to injure the water, and, in fact, but little danger of being polluted by surrounding cesspools compared to that of open wells.

A Trumbull County Swamp.

WARREN, O., May 26.—For years Tamarac swamp has been known as a favorite hunting ground. It is located in Bloomfield township and extends over many acres. The ground in this swamp was so wet in early years that a horse could nowhere cross it. Our county surveyer, E. E. Blanchard, planned a system of drainage, which has been adopted, and work has been progressing upon it during the last year until now seven miles of ditch are doing good work, and away up in the swamp, where a year ago the water was over the boot-tops of the surveyor, the rich soil has been turned up by the plow. Before the inception of the drainage system the swamp land was held at a mere nominal figure, not more than $3 per acre. The cost of the drainage has been $4 per acre. Last summer, after the ditching begun, a portion of the swamp lands were sold for $18 per acre, and to-day it is valued far above that figure. Seventeen miles more of ditch are planned, and when completed it is thought the land will be the most valuable in the county, it being covered with four or five inches of rich muck.

Mr. Charles Huber, who owns 170 acres of the tract, has built a fine residence in the forest. Everything but the house has the air of the backwoods. Past the house runs a ditch 9 ft. deep and 18 ft. wide. At present it is full of running water. The reclaiming of the land affects a run, which heretofore has been gradually fed the year round by the water from the swamp, affording water power for a grist mill. Now there is a magnificent water power during the wet season, but in summer the stream runs dry. The change is so marked and rapid that in a few years the mammoth swamp will exist only in the memory of the oldest inhabitant. On a dry elevation, in the midst of the moist land, the Moundbuilders have left a memorial to themselves. They are three mounds, circular in form and raised several feet above the surface. The largest is about 15 ft. in diameter and 6 ft. high.

Brown Powder.

Krupp, the great gun-maker, has introduced a new kind of powder, which is deservedly creating quite a sensation among experts, inasmuch as it may lead to the disuse of the black powder. It is known under the modest name of brown powder, owing to its peculiar color, which resembles that of chocolate or cocoa, and owes its discovery to a mere accident. According to the reports on the trials hitherto made, the brown powder has a decided advantage over the black in producing a greater velocity with an equal pressure of gas, and being applicable to guns of every caliber. The remarkable fact about it is that it explodes only in a tightly closed space, while in the open air or in the powder box it ignites slowly without explosion, although it is said to consist of saltpeter, sulphur and charcoal, like the black powder, the difference consisting in the relative proportions of these ingredients. It is supposed that the degree of carbonization of the wood from which the charcoal is made plays a prominent part in the new discovery, as the color of the powder seems to indicate; as also that the dangerous explosions in mixing and preparing it may henceforth be prevented. Of special strategic importance is the fact that the smoke of the brown powder is much thinner, and hence will more quickly disappear than that produced by the black powder. Trials are now making in all the larger artillery services on the Continent, and if they confirm the improvements claimed there can be no doubt that the new invention may produce an entire revolution in the military world.

PRICES OF LABOR.

	Bloomington, Ind.	Chicago, Ill.	Cincinnati, Ohio.	Dubuque, Iowa.	Des Moines, Iowa.	Detroit, Mich.	Evansville, Ind.	Fargo, D. T.	Hastings, Neb.	Joliet, Ill.	Kansas City, Mo.	Minneapolis, Minn.	Omaha, Neb.	St. Louis, Mo.	Toledo, Ohio.
Bricklayer	$4.00	$4.00	$4.50	$4.00	$4.00	$3.50	$3.75	$3.50	$4.00	$3.00	$4.00	$4.00	$4.50	$4.50	$4.50
Brick-mason (front)	5.00	5.00	4.50	5.00	.....	4.00	4.50	4 00	4.50	4.00	5.00	6.00	.....	5.00	6.00
Carpenter	2.50	3.00	3.00	2.75	3.00	2.25	2.00	3 00	2.25	2.50	3.00	2.50	3.00	3.00	3.00
Cabinet maker.	.....	.....	.....	.....	2.75	.....	.....	.....	.....	.....	.....	3.50	3.00	2.75	3.00
Finisher	.....	3.00	3.00	.....	3.00	.....	.....	.....	2.50	.....	.....	3.00	2.75	3.00	3.00
Gas-fitter	.....	2.50@3.00	2.50	2.50	3.50	.....	3.50	3.00	3.00	2.50	3.00	3.50	3.50	3.50	3.50
Laborer	1.50	1.75@2.00	1.75	1.50	1.75	.....	2.00	1.75	1.50	1.75	2.00	2.00	2.00	1.75	2.00
Painter	.....	2.50@3.00	2.75	2.50	2.50	.....	2.50	2.50	2.00	2.50	2.50	2.50	3.00	2.50	3.00
Glazier	.....	.....	.....	.....	.....	.....	2.50	2.50	.....	2.00	3.00	.....	3.00	2.50	2.50
Plasterer	3.50	4.50	2.75	3.00	4.00	3.50	3.00	3.00	3.00	3.50	3.50	4.00	4.00	4.50	5.00
Plumber	.....	4.00	3.00	3.00	4.00	3.50	5.00	3.00	3.00	4.00	3.50	2.75	4.50	3.50	5.00
Stonemason	2.50	3.50@4.00	3.00	3.50	3.50	.....	2.50	.....	3.00	3.50	3.50	3.00	4.00	4.00	4.00
Carver	4.00	4.50@5.00	5.50	.....	.....	.....	5.00	.....	.....	.....	.....	4.00	5.00	7.00	6.00
Stone-cutter	4.00	4.00	3.25	3.50	4.00	.....	3.00	.....	4.00	3.50	4.00	4.00	4.00	4.00	4.00
Stone-setter	3.50	4.00	3.50	.....	.....	.....	3.50	.....	3.00	3.00	3.50	4.00	4.00	4.00	4.00
Roofer (tin)	2.75	2.75	2.25	2.50	.....	.....	3.00	3.00	3.00	2.50	3.00	4.00	.....	2.75	2.50
Slater	2.75	3.00	3.50	3.50	.....	.....	3.00	.....	.....	.....	3.00	3.00	.....	3.00	2.50
Stair-builder	3.00	3.25@3.75	2.75	.....	.....	.....	3.00	5.00	.....	4.00	3.25	3.00	3.50	3.25	5.00
Steam-fitter	.....	3.50	2.50	3.50	.....	.....	.....	3.00	3.50	3.00	3.50	3.50	4.00	3.00	3.50

American Architect.

Proximate Causes of the Wall Street Difficulties.

While the general commerce of the country has been gradually accommodating itself to a lower range of prices, conditions were forming which have at last given a rude shock to that abiding confidence between men without which the present credit system is no more than a figure of speech. The causes which have led up to the events of the week are not far to seek under two heads. To begin with, the officers of old-time banking institutions lent their character, through greed for the exorbitant profits promised, to the most disreputable practices in railroad financiering, until their solvency, and in numerous instances that of the institutions they represented, came to depend upon the possibility of sustaining the quotations of securities not likely to pay dividends in years. As early as 1881 Bradstreet's began to give warning of the unsound conditions. When writing of the sympathetic banking which led to the downfall of the Pacific Bank of Boston, on November 26 of that year, we said:

The lessons to be drawn from the Boston failure relate, first, to the perilous character of the vast amount of railway and other securities issued during the last year, and which will not pay dividends save in the remote future. Sound banking forbids the acceptance of such securities as collateral for loans to any great extent, as, in the event of a check to the bounding prosperity of the country, they can have no more than a nominal value, and this for an indefinite future. President Benyon, of the Pacific Bank, practically permitted a stock speculator to overdraw his account to the amount of something like half a million dollars, in the belief, or rather hope, that a favorable course of the stock market would make all right. The outcome is another warning to all who have to do with the conduct of banks that their position is one of trust to the entire community, and that it is bad morals to put the funds of depositors in peril by making loans on "wild-cat" securities.

The methods of railway promotion and construction which had prompted the above warning were thus outlined in the issue of August 6 preceding, when dealing with the construction company:

This invention is a pestilent excrescence on the railroad system of the country, and it operates by laying a debt on the present for the future to pay—if it can. The construction company was first brought into public notice in this country in connection with the Union Pacific Railway, under the name of the "Credit Mobilier," and the scandal it created is vivid in the public mind to this day. The Credit Mobilier—evidently a French idea from the name—was simply a construction company for building the Union Pacific, and the Central Pacific was built by another construction company under a different name. Since that day construction companies have multiplied and their promoters have grown fat upon the profits, and the railways they built have made fat the receivers into whose hands so many of them have gone.

Suppose that a railroad company desires to extend its line into a new and promising region; or a company is organized to build a new line. If the work be done honestly, the corporation having the work in charge sends out its engineers, gets its surveys made, makes up its estimates, and lets out the work to the contractors, to be done at the lowest price consistent with good work. Upon the estimates of the actual cost of the work, as thus made, the bonds and stocks are sold to pay for it. Bonds and stock are liabilities—burdens—debts, and, of course, the lighter the burden of debt the better the road is off. Now, suppose that the company which is to build the new line or extend an old one does not go honestly to work, but gets the job done by a construction company. The procedure is then different. The actual cost of the new work is ascertained, the same as in the former case, but that is all. The close circle of managing directors have organized themselves and a few favored friends into a construction company. In their corporate capacity as constructionists they will construct the road; in their capacity as directors, they will let the contract for the work to themselves. It is apparent that it is to their interest to make the work as costly as they dare to. The engineers' estimates may show that the road will cost only $12,000 per mile. As directors, they will issue bonds to the extent, say, of $25,000, or even $30,000, per mile, and stock in addition to this. The difference between the actual cost of the work and that at which they, as directors, secretly contract with themselves as a construction company to do it, is their profit. The road, crushed by its enormous burden of bonded debt, may go into bankruptcy within two years of its completion, but the constructionists have pocketed their profits and got out.

The money raised to build the road is almost always derived exclusively from the sale of bonds. Not seldom the stock is given as a bonus to the purchasers of the bonds. People will buy almost anything which is called a bond, when they will not look at stock. This is a notorious fact, nowhere better known than in Wall street. A bond is a lien on the property; it is a first lien on the earnings. At the worst, if default of interest be made, the bondholders may foreclose, and get something back that way. These facts recommend this class of security, to investors. So, if you want to raise money, put out bonds. Any kind of security will do, so long as it is called a bond. If you cannot sell it above par, you can sell it below; and poor indeed must be the bond, so called, which cannot find purchasesr at some price. Promoters of construction companies know this. They feel sure that enough money to build the road or telegraph, and to pay them handsomely for building it, can be raised by selling bonds; and they are seldom disappointed. For example, the great system of roads in the southwest may be cited; such as the Iron Mountain, International and Great Northern, Texas Pacific, Kansas and Texas, and numerous others. These roads are bonded at from $30,000 to $40,000 per mile. It is fair to presume that their actual cost of construction was less than half that sum. Besides the bonds, there is the stock.

This was the sort of business into which the officials of some of the oldest banking institutions in New York were drawn. The bank president came to be the head of this or that syndicate, and roads were constructed in a purely speculative way without expecting an early return on the investment. In truth, as pointed out, it was always other peoples' money that these speculative officials put at risk. With this pernicious union of the bank official and the unscrupulous railway promoter as a leading cause of weakening of public confidence, must be classed the long-continued and most serious abuses in railway accounting. The identity of the bold and unscrupulous speculator and the managing railway director has long been notorious. The reports of earnings have either been entirely suppressed for long periods or have been distorted for speculative purposes. Thus the stock of the Wabash Company, which is now selling at little more than nominal prices, was largely sold in Europe at high figures through fictitious reports based on the payment of dividends with borrowed money at a time when the road was scarcely earning interest on its mortgages. With the exposure of such deceptions it is found that the men whose official position gave them a knowledge of the true state of the company's affairs are seen to have sold out their stock and actually "gone short" of it so as to make another profit by the inevitable fall in its price. A third influence potent for evil remains to be included under this first heading, namely, the proneness of the bank official to speculate on either side of the stock market, at first, of course, with his his own funds, but in the second instance with the funds of his bank, or rather with other peoples property.

The union of these three influences named had so far shaken the confidence of investors and bank depositors, that but a comparatively slight wrench was needed to violently disturb the entire fabric of Wall street credits. This came, as sooner or later it must have come in the vicious custom which had grown up, on the part of the banks, of lending their credit to the stock brokers in the shape of over-certification in order to facilitate their transactions.—*Bradstreet's* May 17.

Up in Brush Craft.

"Talking about sly thieves," remarked a passenger from the West, "maybe you have 'em in New York and Chicago, but for thoroughbred slickness I'd take a Pawnee Indian every day in the week. Them redskins 'll steal anything that can be carried off and the worst of it is they get away with the stuff so completely you can't find it. Remember one time, shortly after I went out there, a surveyor lost a lot of his instruments one night. We know'd the Injuns had took 'em, because there wasn't no other thieves around, but what they wanted of them instruments was a puzzler. The Injun agent and a lot more of us made a thorough search of every tepee and cabin at the agency but no trace of the missing articles could we diskiver.

"When we got through, an old Montana mining prospector named Cowen came up an' said he was in hard luck, an' wanted a bit o' brandy to taper off his spree with, an' if we'd pay him for his trouble he b'lieved he could find the instruments. The surveyor made that all right, and we started out ag'in. 'Did ye sarch that patch o' underbrush, there?' he inquired. 'Every foot of it,' replied the agent; 'we poked around in there for hours; no use goin' there ag'in.' 'But ye don't want to do no pokin' around,' said Cowen; 'just follow me and do as I do.' Then he started in. He wouldn't look around in the bushes at all, but just skipped along catchin' 'm by their tops, one after t'other, trying to pull 'em out. Pretty soon he struck one that was loose; he gave a yelp, pulled harder, when out it came, and down under the roots we found the surveyor's things. 'Can't fool me on their dam brushcraft, if I hev bin drunk for a month,' said old Cowen, as the surveyor handed him a gallon jug o' brandy, 'jist to taper off on, ye know.'"

Engineering News

AND

AMERICAN CONTRACT JOURNAL.

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THE River and Harbor Bill was passed on Thursday on a vote of 146 to 104. The Hennepin Canal item of $300,000 was stricken out.

THE Standard Oil Company, it is rumored, has offered the Pennsylvania Fuel Company $500,000 in cash for its plant. The Edgar Thompson Company pays $120,000 per year for its supply of gas fuel. A new well of extraordinary capacity has been struck on Raccoon Creek in Washington County, Pa., and it is said to leave the Westinghouse well in the shade. The manufacturers of Pittsburg are greatly elated over the recent discoveries of natural gas fuel, and expect to derive very important economic advantages by its use. Property on which it may be found is advancing in value in consequence.

THE Fourth Annual meeting of the Association of Missouri Surveyors and Civil Engineers, held last week, was a great success. Fifty new members were added, and a large number of valuable and interesting papers were read. These will be published at as ear'y date as possible. In the meantime we have a few copies of Proceedings of the meeting of 1883 on hand, for sale at 25 cents each. R. A. Skues, U. S. Deputy Mineral Surveyor, of Pitkin, Colorado, writes us June 7th.

> received the Proceedings of the Missouri Association of Surveyors and Civil Engineers and find it quite an interesting number. I would like to get the Proceedings of its first and second years, and if I am not troubling you too much, I should like to get the Proceedings of others of the State Associations of Civil Engineers."

WE have no knowledge of any printed record of previous meetings of the above Association. For Proceedings of Ohio Society address Benjamin Thompson, Secretary, Urbana, Ohio, and for Michigan, address Prof. R. C. Carpenter, Lansing, Mich. They are all good investments for Surveyors, and more than worth all they can possibly cost.

The Connecticut Engineers and Surveyors Association.

The following circular has been issued to Members of the Association, and to surveyors and engineers throughout the State:

NORWICH, CONN., JUNE 5, 1884.

Dear Sir: You are hereby cordially invited to attend an informal meeting of the Connecticut Engineers and Surveyors Association, to be held in the Common Council Chamber, City Hall, Hartford, Conn., at 10 o'clock A. M., Wednesday, June 18, 1884. (Buckingham day.)

A pleasant social time is anticipated.

Per order Executive Committee.

C. F. CHANDLER, Secretary.

It is hoped that there will be a large attendance; the time and place are auspicious, and the Association already has a membership capable of rendering a meeting interesting if it chooses to try.

Damage done by R. R. Surveyors.

Considerable complaint is made against the surveyors of the Pennsylvania Schuykill Valley Railroad by the farmers between Port Clinton, Schuykill county, and Hamburg. The men tramped through the grass and grain fields in every direction, thereby causing great loss to the farmers. The surveyors even go so far as to pull down fences whenever they obstruct their way. They were consulted with, but will not give any satisfaction. Several of the losers will leave for Philadelphia to interview the officials of the Pennsylvania Company to see if the destruction cannot be stopped when it is not necessary. A number intend sueing the company for damages.—Philadelphia *Press*.

Every engineer who has assisted in the location of a railway line through a thickly settled agricultural region will recognize the above scene, and accompanying grief of the farmers. The facts are, however, that railroad surveyors are not usually given to the wanton injury or destruction of property. Fences *have* to come down when necessary, but in our experience they were always carefully restored after the transit had passed on; a field of standing corn or any other grain is not much injured by a straight line, and probably five or ten dollars would be a maximum limit of damages from running an ordinary curve through any cultivated field. The disposition of engineers is to conciliate as much as possible, rather than irritate, and we imagine that either the above corps of surveyors is made up of unusually boorish fellows, or that the communication is from some chronic rural grumbler.

Surveyors' Associations.

We have recently been applied to for copies of the Constitution and By-laws of the American Society of Civil Engineers by parties who were about to form Associations of Surveyors and Civil Engineers. We advise all such to "go slow" on the subject of Constitution and By-laws, and to put all their early energies and fresh enthusiasm into the practical work of preparing and reading papers, discussing the same, and promoting general conversation on professional subjects. A great deal of time and energy is wasted on preliminary work, and when the real hard work of the society is reached there are only a very few individuals prepared to do their part.

We have in mind a western Association, which started off with a flourish of mutual trumpeting by its few members, who were all "good fellows" and capable engineers, but who were led on by an over-enthusiastic officer. The Constitution and By-laws of the Am. Soc. of C. E., were adopted bodily, with change of name only, and a too small difference in fees; printed copies were issued and editorial notices were solicited. We never heard of a single paper being read, and in due time the inevitable dissolu ion came. If the same energetic and capable engineers had prepared papers for discussion instead of studying the voluminous document of the American Society, the result of years of tedious discussion, they would have had something to show besides the vouchers of considerable printing bills, and possibly some neatly written records of windy meetings.

In contrast to the above there is in this city an association called the Twilight Club, a name arising from its meeting between sunset and dark, which has no Constitution, no By-laws, no dues, no debts, no club-house, no *anything* of the ceremony and organization of the usual club; it meets every Thursday afternoon at 6 o'clock, in a first-rate restaurant, formerly in the Mills Building, but now on the top floor of the Field Building, and overlooking the beautiful New York Bay; eligibility to membership consists in being a "clubable fellow" and having at least one dollar in pocket with which to pay for an excellent dinner. The chairman is selected beforehand, the managing genius is Chas. F. Wingate, a well known sanitary engineer and journalist, and the members and guests include a now uncountable list of men prominent in trade, politics, journalism and the professions of law, medicine and the ministry. There is a subject for discussion each evening, and it is generally well discussed. The association is a success; acquaintances are made; a great deal of valuable information is obtained; there is no time wasted; and the expense is trifling.

We suggest therefore to prospective associations of surveyors the necessity for simplicity in organization, the husbanding of resources, intellectual and pecuniary, and the subjection of all other considerations to the main questions of reading papers, exchanging experiences, cultivating acquaintanceship, and so building up a strong association with some other binding material than a printed code of By-laws that are never read and which are practically of no use.

Michigan Association of Surveyors and Civil Engineers.

We are in receipt of the published proceedings of the Fifth Annual Meeting of the above Association, held at East Saginaw, January 1, 2, 3, and 4, 1884. We have already published a very full report of this Convention and will not repeat it here. We have also published several of the papers which were read, in full or condensed. We give, however, the list in full:

Drainage of Large Marshes, by C. E. Hollister; Roads and Road making, by W. B. Sears, Ch. Eng. D & P. M. R. R.; Notes on the Construction and Equipment of Narrow Gauge Railroads, by A. L. Reed, Ch. Eng. P. H. & N. W.R. R. (This article in connection with that by Mr. Hodgman in the proceedings of fourth meeting forms a complete treatise on Narrow Gauge R. R. building.) Questions in Practice, by I. H. Leavenworth; Timber Trestle at Grand Rapids, by George Masson, Ch. Eng. D. G.-H. M. R. R; Public Water Supply and Water-Works, by W. R. Coats, and Designing a Steamer, by H. C. Pearsons, Ferrysburg.

Concerning this and the published proceedings of previous meetings, Prof. R. C. Carpenter, Secretary, Lansing, Mich. writes us as follows:

"I can supply a limited number of copies for 30 cents each, also copies of the Fourth and Third Proceedings."

The contents of these are as follows:

PROCEEDINGS OF THIRD MEETING.

Legislation for Surveyors in Michigan, Foundation and Piers of the Wheeling and Lake Erie R. R. bridge at Toledo, by Prof C. E. Greene; Water-Works for small cities, G. W. Pearsons, Kansas City; Compass Deviation on Vessels, and the Conversion of Compass Courses, by H. C. Pearsons; Drainage Engineering, Prof. R. C. Carpenter; Practical Questions, by I. H. Leavenworth.

PROCEEDINGS OF FOURTH MEETING.

Legislative Needs of Surveyors, by Geo. E. Steele; North Lansing Mill Dam, by H. D. Bartholomew; Wooden Pavements, by H. G. Rothwell; Water a Source of Engineering Difficulty, by Prof. C. E. Greene; Common Roads, by Burton Kent; City Surveying, by A. J. Tead; Logging Railroads, by E. F. Guild; Practical Questions, by I. H. Leavenworth; Instruments Neces-

sary for Surveyors, by Prof. J. B. Davis; Railroad Surveying, by F. Hodgman; Traverse Surveying, by Prof. J. B. Davis; Judicial Functions of Surveyors, by Judge T. M. Cooley.

The last three articles being very complete.

We certainly advise surveyors to secure these publications while they can. There will never be a better time than now, as the demand for them is growing, and they form a really very valuable collection of papers of direct interest to surveyors which cannot be had elsewhere. The publications of these Associations are growing in value all the time, and the surveyor who can obtain full sets of them from the different States can always find a purchaser when he is ready to sell. They are for surveyors, and as it is not likely that surveyors will support a professional journal for some time to come, the best literature of their profession will be found in these annual reports of societies.

Columbia, N. Y., College Commencement.

The following engineers graduated from Columbia on Wednesday:

DEGREE OF ENGINEER OF MINES:—Herbert C. Alden, Edward C. Barnard, Oscar Bodelson, John T. Corcoran, William P. Duncan, Josiah H. Fitch, George E. Fitzgerald, Samuel S. Fowler, A. B., Edgar B. Gosling, Samuel P. Griffin, Jr., Louis N. Gross, B. S., James F. Kemp, A. B., Andrew J. Lamb, John W. McGenniss, Jr., Charles W. Miller, William F. Morgan, A. B., Robert Mulford, Arthur H. Napier, Wolcott E. Newberry, William Newbrough, A. B., John I. Northrop, Charles A. Painter, Charles F. Pearis, Charles E. Pellew, Lewis J. Powers, Jr., William R. Proctor, Daniel W. Reckhardt, Frederick Roeser, B. S., Charles G. Slack, Thomas E. Snook, Beverly R. Value, George E. Wood.

DEGREE OF CIVIL ENGINEER:—William C. Adams, Edgar Grant Barratt, V. M. Braschi, Ph. B., E. M., John Rowlet Brinley, Langdon Cheeves Easton, George Ernest Fahys, James T. Horn, A. B., Robert Albert McKim, Daniel Edward Moran, Abram Skidmore Post, Jacob M. Rich, E. M., J. C. Richardson, E. M., Charles B. Rowland, H. A. Smedberg, A. B., Samuel Gaylord Tibbals.

The Health of Canadian Cities.

At a meeting of the Canadian Sanitary Association held at Ottawa for the purpose of appointing a local committee, Dr. Robillard disputed the statistics of the Local Government in regard to the death rate of the city. The report placed Ottawa's death at 44 per thousand, while it was only 28 per thousand.—*Smiths Falls, Ont., Independent.*

Health Boards have recently been formed throughout the Dominion, and the county is struggling with the rudiments of sanitary knowledge. Undoubtedly the collection of health statistics is performed in a very crude and utterly unreliable manner as the above paragraph indicates. From the Mortality Report published in the *Sanitary Engineer* of June 5th, we learn that in the seven principal cities of New England the *lowest* annual death rate per 1,000 of population for the week ending May 24th, was 10.4 and the *highest* 19.9, the mean being 17.6; of the eastern cities Albany showed a death rate of 28.3; New York 25.1; Brooklyn 18.5; Hudson County, N. J., 24.8; Newark, N. J., 18.7; Philadelphia 19.8 and Wilmington, Del. 19.1; the mean rate being 22.1; the lake cities show a mean of 19.8; the river cities 16.4, Indianapolis and Evansville being the largest; the Southern cities show a mean of 23.8 per 1,000 for white, and 46.5 for colored population; the grand total mean in 32 U. S. cities being 21.5 per 1,000. At the same time the death rate in foreign cities is reported as follows.

Total in	28 English Cities	21.8
"	8 Scottish Cities	24.9
"	16 Irish Cities	26.6
"	142 German Cities	26.4
"	139 German Cities	26.6
"	137 German Cities	25.3
"	15 Swiss Cities	29.1

The "44 per 1,000" for Ottawa city, Canada, is therefore certain to be incorrect unless we class the people of that city with the negroes of the South in their habits of life and exposure to disease; at "28 per 1,000" the rate is a remarkable one for a northern city, and one so small as Ottawa City. Only one or two cities in the list we have given comes up to that rate, and we feel safe in asserting that the death rate of Ottawa City is not even one-half that claimed even by Dr. Robillard. A more careful record will have to be kept than has yet been effected; if the rate is anything like what is published above, there is one more good reason for an extensive emigration from Canada to a less deadly climate.

Association of Municipal Engineers.

The Association of Municipal and Sanitary Engineers met recently at Ealing, Eng., when Mr. C. Jones, the engineer to the local board (under the title of "Twenty Years' Development of a London Suburb)" gave an account of the remarkable rise and prosperity of Ealing. The sanitary arrangements are admirable. The sewage works were the earliest commenced in the Thames Valley, and are now extended to adequate proportions with the increase of population. That increase has been from 5,000 in 1869 to 18,369 persons now; and the rateable value of property has risen correspondingly in the time from £21,500 to £118-071. The influence of the progress made in the sanitary arrangements is well indicated by the diminished death rates, which have decreased from 18.26 in 1875 to 11.23 per thousand in the past year.

A Mechanical Engineering Society.

An organization known as the "Mechanical and Practical Club of the City of New York" has lately been constituted and perfected, whose aims and objects are the proper enforcement of the new law passed by the Legislature, April 21, 1884, which divides engineers into first, second and third grades; mutual elevation; benefit and protection of its members, and discountenancing any project or enterprise that would threaten or interfere with the harmony of the organization. No political or religious discussions are permitted at its stated meetings, which are held in the parlors of the Sinclair House, 8th St. and Broadway.

The following representative engineers have been elected:

President: James Morrow.
Vice President: James Barnes.
Secretary: J. H. Fisher.
Treasurer: E. J. Wood.

Board of Directors: James Morrow, James Barnes, J. H. Fisher, E. J. Wood, Theo. Jennings, James F. Wilson, James Rutter, Daniel Cary, Wm. O. Cloyes, Chas. E. Rankin, Wm. H Lee, H. H. Nelson, Samuel Rushworth, John E. Drew, G. A. Traver.

Board of Trustees: James Rutter, Wm. O. Cloyes, Chas E. Rankin.

University of Missouri Commencement.

COLUMBIA, MO., June 5.—The forty-third commencement of the University of Missouri closed this afternoon and terminated one of the most interesting and successful collegiate years in the history of the institution. The following is part of the programme:

Music.

Prayer by Rev. Mr. Whitten.

Thesis and valedictory address of engineering class, "Every County should have an Engineer." E. A. Boeger, S. B., P. E. B. C. (?)

Salute of 38 guns by university cadets, Lieutenant J. J. Haden, United States army, commandant.

A vast audience, much too large to be accommodated in the chapel, attended these exercises. The thesis and valedictory address by Mr. Boeger was a very creditable paper indeed. The following are Engineering Graduates:

Ernest A. Boeger, S. B. C. E.; Edward Everett Wall, C. E.; Ernest Ellsworth Smith, C. E.; Robert Alonzo Sullins, C. E.; Robert Franklin Grady, C. E.; Henry Harris Pendleton surveyor; Charles Jaeger, surveyor; Julius Henry Stowe, surveyor; Tyra Clifton Hughes, C. E.; John Jacob Sanders, topographical engineer; Edward Campbell Anderson, surveyor; Vard Houghton, surveyor; George Condit Hayden, topographical engineer; John Wesley Gerris, topographical engineer; Thomas Clinton Thomas, topographical engineer; 1880, C. E., William L. Sidden, topographical engineer; 1881, C. E., James W. Malone, C. E., Carlton William Sturtevant, military engineer, C. E.

The 16th Annual Convention of the American Society of Civil Engineers.

The choice of location for this 16th Annual Convention of the American Society of Civil Engineers, has been a happy one, and in the number of members attending has exceeded, we believe, any previous convention; the list appended proves the very general and widely spread interest taken in this particular meeting.

The special train from New York, for which the members were indebted to the courtesy of the N. Y., West Shore & Buffalo R. R., left Weehawken at 8.30 A.M. on Monday, June 9th, and under the personal care of Mr. Walter Kattè, E. L. Corthell, and Mr. Blondin, the engineering officials of this road, the 230 members and their lady friends, enjoyed to the utmost, the rapid and easy passage through an always charming and sometime romantic section of the State.

Stops were made to permit the examination of some few of the many engineering problems so well solved upon this model modern railway, notably at the Chain Dock Bridge, where a steep rock slope, under a very innocent sheet of water had caused the slipping off into depths of 160 ft. of the timber crib-work first deemed sufficient for a sub-structure, and finally made necessary an iron span of about 290 ft. At another point an abutment was provided for one end of a bridge by projecting a plate girder beyond the rock and resting the outer truss upon it, resisting any tilting tendency in the transverse Cantilever by strutting upward against the rock. The Rondout Bridge and the heavy retaining walls at Newburg were included in the inspection.

Lunch was served at Kingston, and a dinner at Syracuse, and on the train itself lighter refreshments were continually being served by the generous managers of the special. The train arrived in Buffalo about 9.30 P.M., and the members were soon distributed among the various hotels to which they had been assigned, the Genesee, Tifft, Mansion and Stafford houses.

On Tuesday morning, at 11 o'clock, the first meeting of the Convention was called to order in the hall of the Y. M. C. A. of Buffalo. According to the established custom, Mr. T. Guilford Smith, a member of the local committee was appointed to preside over all excepting the business meetings of the Convention. Proceeding at once to business, the Secretary announced the papers to be read before the Convention (a list of which has already appeared in ENGINEERING NEWS) and also the time and place of the various meetings and excursions, as finally arranged by the local committee.

The papers read during the morning session were as follows:—Experiments on Submerged Weirs, by Jas. B. Francis, of Lowell; The American Line from Vera Cruz to the City of Mexico, by A. M. Wellington, of N. Y.; The Ravages of the Teredo Navalis, by P. C. Asersen, of Norfolk, Va.; and Landing Arrangements on the Mississippi, by Robt. Moore, of St. Louis. The papers of Messrs. Francis and Wellington were read by title and briefly outlined by the authors; the other two papers were read in full, and the *teredo* was especially productive of an interesting and

prolonged discussion, in which about a dozen of the members present participated.

A persistent rain, which had set in with the night before, interfered with the official programme for Tuesday afternoon, and the reading of papers was continued, instead of the proposed excursion to the Tifft Farm Improvements as proposed. The enterprising reporter of one Buffalo journal however, had taken too much for granted, and discounting the excursion gave his paper a full description of the trip, in all its detail of mud and engineering interest.

The papers presented in the afternoon were, Analysis of the Rainfall at Lake Cochituate, by Desmond Fitzgerald, of Brookline; Application of the Water Power of Niagara to Electricity, by Benj. Rhodes, of Niagara, and The Heavy Gun Question, by Capt. O. E. Michaelis U. S. A. Mr. Fitzgerald's paper being mainly statistical, the author only gave a general summary of results, and some deductions therefrom; the paper was discussed by Prof. Fletcher, of Dartmouth, Clemens Herschel, of Holyoke, Chas. E. Moore, of the Wabash R. R. and N. M. Edwards, of Appleton, Wis. Mr. Rhodes estimated the quantity of water now wasting over the Falls of Niagara at 7 million horse-power; of this only about 1000 horse-power was utilized on the American side.

The paper of Captain Michaelis first pointed out what American inventive talent had added to the defensive armor and offensive weapons of nations across the sea, while the great seacoast of our own United States was literally defenseless. He explained what Parrott had done for rifled cannons during our civil war, and how Rodman had added a new product, gun-metal, to the arts when he invented his system of casting heavy ordnance. While the United States was powerful and universally respected, the government was not in a "touch-me-if-you-dare-position," and his paper was a forcible plea for the fostering of American talent in the direction of home defense. The condition and plant of our great iron and steel manufactories were reviewed, and it was shown that while they were without the powerful hammers and other plant required for the making of modern ordnance, as now turned out from the shops of Armstrong and Herr Krupp, the plant did exist for the manipulations of cast steel. And, according to the author, it is with cast-steel rifled guns, that Americans must regain the prestige lost within the last twenty years, and again become the leaders in all matters of heavy guns and iron-clad ships, as they were in 1863. The inventive talent requisite exists now among our people, but for lack of home encouragement it is eagerly bought up by foreign nations.

About 5 P.M. the convention went into business session, Vice President J. P. Davis presiding. The first business being the appointment of a nominating committee of officers of 1885, for the society, the following gentlemen were elected:—George S. Fields, Buffalo; Albert Fink, New York; Geo. E. Gray, San Francisco; T. C. Keefer, Ottawa, Canada, and Henry Flad, of St. Louis. The committee on "A Uniform System of Testing Cement," reported progress, with the following change in the committee since last meeting; the retirement of the new President, Mr. Whittemore, except as an ex-officio member, and the substitution of the names of Arthur Beckwith and Mr. Thos. C. McCollum.

Mr. Sandford Fleming, Chairman of the Committee on Standard Time, reported in person as follows:—

The committee referred, with much satisfaction, to the fact that the railway authorities generally had determined to adopt one of the reforms advocated by the society, and that on the 18th of November last, trains commenced to run throughout the United States and Canada by "hour standards," and that the public, with singular unanimity, accepted the change which they now universally recognize as a great public boon. In the documents widely circulated two years ago by the committee, under the authority of the society, a series of questions bearing on the whole subject were submitted to men in prominent positions in the railway world, including engineers, traffic managers and known scientists in every State in the Union and in every province of Canada. To these questions the committee invited replies, and among the large number of replies received, the committee had an emphatic expression of opinion from many persons with respect to the division of the day into hours. Ninety-two per cent. of those heard from gave their unqualified support to the proposal to abandon the old traditional division of the day into halves of twelve hours each, and to adopt a single series of hours from midnight to midnight, numbering from one to twenty-four. That the American Society of Engineers, as a body, fully appreciated the importance of the change is evident from the fact that since the last annual meeting the society had practically adopted the 24 o'clock system in all arrangements of meetings, and in all matters in which the hour of the day is referred to. The committee cannot doubt that the influence of the society in this reform will undoubtedly lead to equally satisfactory results, as have been obtained by their efforts in the establishment of the standard hour system throughout the continent. The committee deem it proper to recall the action taken at the Washington convention in May, 1882. On that occasion the society resolved to petition Congress to take steps to establish a prime meridian as a zero for reckoning time, and for the computation of longitudes. Subsequently, Congress passed a joint resolution authorizing the President to call an international conference to fix on, and recommend for universal adoption, such a zero, and in conformity with the act of Congress, the President has called an international conference to be held at Washington on the 1st of October next. The act of Congress has authorized the appointment of three delegates for the United States to the conference, and it appears to the committee appropriate that the railway and the other interests of the country of which, to a certain extent, the American Society of Civil Engineers is the exponent, should be there represented. Your committee accordingly recommend that the President of the United States be respectfully memorialized by the society to appoint one delegate to represent these important interests at the Washington conference.

In accordance with the spirit of this report, D. J. Whittemore, President of the Amer. Soc. C. E., was recommended to be appointed by the President of the United States to represent this Society in the International Congress to be held at Washington, D. C., on Oct. 1. 1884.

On Tuesday evening a large audience both of members and citizens of Buffalo, assembled in the Convention Hall, and was presided over by T. Guilford Smith. Owing to the unexpected absence of Mayor Scoville, of Buffalo, and the illness of E. L. Hedstrom, President of the Merchants Exchange, the programme as laid down was somewhat interfered with. Letters of regret were read and R. R. Hefford President of the Common Council of Buffalo, was introduced, and in a brief but hearty speech welcomed the visitors to Buffalo.

To this Pres. Whittemore responded on behalf of the Society of Civil Engineers and then proceeded to deliver his annual address, which will be published next week.

On Wednesday morning, in spite of a steady, penetrating and depressing drizzle, the members took a special train and visited the extensive works of the Union Bridge Company, and spent some time in examining the detail of the various processes necessary to the production of a modern iron bridge of the latest approved type. From the bridge works the party proceeded to the Tifft Farm Improvements, and found—not overgrown turnips and choice live-stock, as some of the members had supposed, but an engineering scheme of great magnitude, in progress, which upon completion will add eight miles of docks to the present five miles now in use. Huge dredges were now at work upon the channels; pile-drivers made solid the sides and provided foundations for future structure, and in one black pile was lying 120,000 tons of coal, ready to be re-shipped to the far lake cities of the West.

As the Lake front is exposed to serious wash, men were engaged in the making and placing of mattresses, under the skilled direction of Kanters & Sons, engineers who have gained their experience upon the dykes of Holland, the methods in use being identical with that for so many years and so successfully applied by the Dutch Engineers.

LIST OF MEMBERS AND VISITORS AT BUFFALO CONVENTION OF AM. SOC. C. E., REGISTERED UP TO 10:40 P. M., TUESDAY.

Don J. Whittemore, *President*, Ch. Eng. C. M. & St. P. R'y, and Mrs. Whittemore, Milwaukee, Wis.; Joseph P. Davis, *Vice President*, Eng. American Bell Telephone Co., and Miss A. W. Rice, New York City; John Bogart, *Secretary and Librarian*, Mrs. Bogart and Miss E. H. Bogart, New York City; J. James R. Croes, *Treasurer*, and Miss H. R. Croes; and *Directors* Theodore Cooper and William R. Hutton, New York City; Fred. Graff and Mrs. Graff, Philadelphia, Pa.; Hon. William J. McAlpine, *Past President*, Bay Ridge; Col. Julius W. Adams, *Past President*, and Miss Adams, Brooklyn, N. Y.; and James B. Francis, *Past President*, and Mrs. Francis, Lowell, Mass.; Squire Whipple, *Honorary Member*, and Mrs. Whipple, Albany, N. Y.; A. V. Abbott, Eng. Dept. Tests and Experiments, Fairbanks & Co., New York City; W. M. Allaire and mother, New York City; James Archbald, Ch. Eng. D. L. & W. R. R., and Miss Archbald, Scranton, Pa.; Col. J. H. Armington, Pres. and Eng. Brooklyn Gas Light Co., Mrs. Armington, niece and friend, Brooklyn, N. Y.; Civil Engineer P. C. Asserson, U. S. N., and Mrs. Asserson, Norfolk, Va.; E. R. Andrews, New York City; T. W. Baldwin, Mrs. Baldwin and Mrs. George Pierce, Bangor, Me.; W. W. Bonnett and Mrs. Bonnett, Waterbury, Conn., Miss Bonnett, Elizabeth, N. J.; A. P. Boller, Consulting Eng., and Mrs. Boller, New York City; Fred. Brooks, Boston, Mass.; H. R. Bradbury and Mrs. Bradbury, New York City; A. Bonzano, Ch. Eng. and Vice Pres. Phœnix Bridge Co., and Mrs. Bonzano, Phœnixville, Pa.; Geo. Burnham, Jr., and Mrs. Burnham, Philadelphia, Pa.; Thomas E. Brown, Jr., New York City; Prof. Arthur Beardsley, Swarthmore, Pa.; John W. Bacon, Railroad Commissioner, and Mrs. Bacon, Danbury, Conn.; A. P. Barnard, New York City; Oliver W. Barnes, Consulting Eng. South Pa. R. R., and Miss Louise Barnes, New York City; Geo. H. Boynton, Asst. Eng. C. R. I. & P. R'y, Davenport, Iowa; H. W. Brinckerhoff, Brooklyn, N. Y.; Geo. H. Bishop, Middletown, Conn.; H. Bissell, Master Maintenance of Way, Eastern Railroad, Salem, Mass.; H. I. Bliss, La Crosse, Wis.; H. D. Blunden, Ch. Eng. Maintenance of Way, N. Y., L. E. & W. R. R., New York City; M. J. Becker, Ch. Eng. P. C. & St. L. R'y, Mrs. Becker, Columbus, Ohio, and Mrs. G. Lindenthal; C. H. Bunce, City Engineer, Hartford, Conn.; Chas. B. Brush and Mrs. Brush, Hoboken, N. J.; F. H. Clement, Div. Eng. S. P. R. R., Everett, Pa.; James Christie, Eng. Pencoyd Iron Works, and son, Pencoyd, Pa.; Martin Coryell and Mrs. Coryell, Lambertville, N. J.; B. S. Church, Ch. Eng. Aqueduct Commission, New York City; Prof. A. G. Compton, Mrs. Compton and son, New York City; F. A. Calkins, Asst. Eng. Central Park, New York; J. G. Chase, Cambridgeport, Mass.; E. L. Corthell, Ch. Eng. N. Y., W. S., & B. R'y, and Mrs. W. J. Karner, New York City; Thomas C. Clarke and Miss R. L. Clarke, New York City; W. G. Corthell and Mrs. Corthell, Boston, Mass.; Joseph P. Card, St. Louis, Mo.; T. M. Clarke, editor *American Architect and Building News*, and Mrs. Clarke, Boston, Mass.; C. W. Durham, Pres., Durham House Drainage Co., New York City; E. B. Dorsey, New York City; F. C. Doran, City Engineer, Richmond, Ind.; P. P. Dickinson and Mrs. Dickinson, New York City; Chas. G. Darrach, Ridley Park, Pa.; F. J. Darlington, Eng., P. C. & St. L. Ry., Pittsburg, Pa.; Capt. C. E. L. B. Davis, Corps of Engineers, U. S. A., Detroit, Mich.;

C. E. W. Dodwell, Assoc. M. Inst. C. E. Asst. Eng., Ontario & Quebec Ry., Toronto, Canada; W. A. G. Emonts, Asst. Eng. P. & R. Ry., and Mrs. Emonts, Philadelphia, Pa.; Peter Emslie, Buffalo, N. Y.; N. M. Edwards, Eng., Green Bay & Miss. Canal Co., Appleton, Wis.; C. G. Force, City Engineer, Cleveland, Ohio; James L. Frazier, Supt. Road Dept. C. O. & S. W. R. R., Louisville, Ky.; S. J. Fields, Eng. Niagara Bridge Works, Buffalo: Chas. A. Terry, Asst. City Engineer, New Haven, Conn.; Clark Fisher, Trenton, N. J.; Frank N. Fuller, Eng., Wellesley Water Works, and Mrs. Fuller, Boston, Mass.; J. Foster Flagg, Mrs. Flagg, and Miss Wiggin, New York City; Prof. R. Fletcher, Dartmouth College, N. H.; John T. Fanning and Mrs. Fanning, Manchester, N. H.; H. N. Francis, Asst. City Engineer, Providence, R. I.; Sandford Fleming, Mr. and Mrs. Frank Fleming, and Mr. S. H. Fleming, Ottawa, Canada; Desmond Fitzgerald, Supt. Western Div. Boston Water Works and Mrs. Fitzgerald, Brookline, Mass.; Prof. E. A. Fuertes, Cornell University, and Mrs. Fuertes, Ithaca, N. Y.; G. B. Francis, Asst. Eng. N. Y. W. S. & B. Ry., and Mrs. Francis, Weehawken, N. J.; Gen. George Field, *Chairman Local Committee*, Union Bridge Co., Buffalo; J. L. Gillespie, U. S. Asst. Eng., St. Paul, Minn.; C. E. Goad and Mrs. Goad, Montreal, Canada; Robert Gordon, Supt. of Works, British Burmah, India; Wm. E. Hoyt, Supt. Rochester & Pittsburg R. R., Rochester, N. Y.; S. A. Harrison and Mrs. Harrison, Milwaukee, Wis.; A. H. G. Hardwicke, Buffalo, W. M. Hughes, and Mrs. Hughes, Cleveland, Ohio, W. W. Hegeman, Ch. Eng. S. L. E. & O. R. R., Rhinebeck, N. Y.; A. W. Hoffman, W. A. Haven and Mrs. Haven, Buffalo; R. Hering, Mrs. Hering and Mrs. John P. Watson, Philadelphia, Pa.; Clemens Herschel, Hydraulic Eng. Water Power Co., Holyoke, Mass.; F. B. Howard, Detroit, Mich.; R. A. Hale, Essex Water Power Co., and Mrs. Hale, Lawrence, Mass.; S. S. Haight, Miss M. E. Haight and Master S. C. Haight, West Farms, N. Y.; C. M. Harris, Miss Harris and friend, New York City; Edmund Hayes, Union Bridge Co., Buffalo; C. W. Hunt, New York City; W. B. Knight, City Engineer, Kansas City, Mo.; W. H. Jennings, Ch. Eng. C. H. V. & T. Ry., and Mrs. Jennings, Columbus, Ohio; E. H. Keating, City Engineer, Halifax, N. S.; T. P. Kinsley, Le Roy, N. Y.; Walter Katté, Vice Pres. and Ch. Eng. N. R. Const. Co.; Ch. Eng. W. S. and O. Terminal Co., and Mrs. Katté, New York City, E. C. Kinney, Ch. Eng. D. M. & D. Ry., Des Moines, Iowa; L. H. Knapp, Superintendent Water Works, Buffalo; Thomas C. Keefer and Mrs. Keefer, Ottawa; C. Latimer, Ch. Eng. N. Y. P. & O. Ry., Cleveland Ohio; A. W. Locke, Man. T. & G. R. R. & Hoosac Tunnel and F. B. Locke, North Adams, Mass; F. C. Lowthorp, and Mrs. Lowthorp, Trenton, N. J.; W. H. Lotz and Mrs. Lotz, Chicago, Ill.; T. D. Lovett and Miss Hattie Lovett, Cincinnati; T. B. Lee, New York City; J. J. McVean, Ch. Eng. D. L. & N. R. R. Ionia, Mich.; John MacLeod, Gen. Supt. L. N. A. & C. Ry., Ch. Eng. Kentucky and Indiana Bridge Co., and Mrs. MacLeod, Louisville; B. F. Morse, Cleveland; Geo. A. Marr, U. S. Asst. Eng. and lady, St Paul; F. Mercur, Gen. Supt. and Eng. Lehigh Valley Coal Co., Wilkesbarre, Pa.; Charles Macdonald, Union Bridge Co., and Mrs. Macdonald, New York City; R. Moore, St. Louis; H. G. Morse, Morse Bridge Co., Youngstown. Ohio; D. E. McComb, Asst. Eng. District Government and Miss Elliott, Washington, D. C.; Capt. O. E. Michaelis U. S. A. and Mrs. Michaelis, Philadelphia; Maj. L. C. Forsyth, Mrs. and Miss Forsyth, Buffalo; C. C. Martin, Ch. Eng. and Supt. New York & Brooklyn Bridge, Mrs. Martin, Miss L. A. Martin and Miss M. E. Martin, Brooklyn; W. H. McClintock, Eng. L. & N. R. R. New Orleans; Civ. Eng. A. G. Menocal, U. S. N. and Mrs. Menocal, Washington, D. C.; Mrs. R. E. Myers and Miss F. A. Myers, New York City; Henry Manley Asst. City Engineer and Mrs. Manley, Boston; Civ. Eng. T. C. McCollom, U. S. N., New York City; T. H. McKenzie, Sec. and Eng. Water Co., Southington, Conn.; W. Mansfield, Eng. C. St. L. & P. Ry, Richmond, Ind.; R. E. McMath, St Louis, Mo.; J. A. Monroe, Providence, R. I.; E. B. Noyes, Brooklyn, N. Y.; J. A. Ockerson, Asst. Eng. Miss. River Comm. St. Louis; T. W. Orbison, Supt. Hydraulic Power Co., Iron Mountain, Mich.; James Owen, Mrs. Owen and daughter, Newark, N. J.; L. F. Olney, Dept. Public Parks, New York City; E. C. W. O'Brien, Buffalo; G. W. Polk, San Antonio, Texas; G. H. Pegram, Edgeworth Iron Co., Wilmington, Del.; Geo. W. Parsons, Harrisburg; H. C. Putnam, Eau Claire, Wis.; A. B. Paine, Ch. Eng. P. S. & N. E. R. R. and Mrs. Paine, New York City; R. G. Packard, Brooklyn; Benj. Rhodes and Mrs. Rhodes, Niagara Falls, New York; Geo. S. Rice, Boston, Mass.; W. N. Radenhurst, Asst. Eng. Water-Works, Rochester; David Reeves, Pres. Phoenix Iron Co., and Mrs. Reeves, Phoenixville, Pa.; P. Roberts Jr., Philadelphia; James L. Randolph, Consulting Engineer B & O. R. R. and Mrs. Randolph, Martinsburg, W. Va.; Geo. W. Rafter, Eng. Fredonia Water-Works, Rochester New York; William Roberts, Waltham, Mass; J. R. Richards, Boston, Mass; W. H. Starr, Roadmaster B. and R. Div. N. Y. L. E. & W. R. R. Buffalo; C. C. Schneider, New York City; J. F. Sorzano, N. Y. City; W. H. Smith, Chief Engineer S. B & S. R. R. and Mrs. Smith, Philadelphia Pa.; L. M. Slade, Bridgeport, Connecticut; R. Surtees, City Engineer, Ottawa, Canada; C. L. Strobel, Asst. Pres. Keystone Bridge Co., Pittsburg; S. C. Schureman, Jersey City; R. A. Shailer, Eng. Bridges and Buildings, C. M. & St. P. Ry., Milwaukee; W. H. Searles and Mrs. Searles, Elyria, Ohio; R. P. Staats, Eng. Eastern Div. N. Y. L. E. & W. R. R., Jersey City; T. Guilford Smith, *Secretary Local Committee*, Buffalo; Prof. G. T. Swain, Boston; D. McN. Stauffer, Editor ENGINEERING NEWS, New York City; F. S. Stevens, Div. Eng. Mohawk Div. N. Y. W. S. & B. Ry. and Mrs. Stevens, Syracuse; Stevenson Towle, Ch. Eng. Sewer Dept., New York City; A. W. Trotter and Mrs. J. T. Trotter, New York; M. M. Tidd and Miss Alice Tidd, Boston; B. Thompson, Sec. Ohio Soc. Civ. Eng., Urbana, Ohio; E. B. Van Winkle, New York City; John G. Van Horne, Mrs. Van Horne, Miss Van Horne and Miss Russell, Jersey City, N. J.; L. L. Wheeler, U. S. Asst. Eng. and Mrs. Wheeler, St. Louis, Mo.; Thos. J. Whitman, Water Commissioner, and two daughters, St. Louis, Mo.; E. B. Weston, Asst. Eng. Water Dept., Providence, R. I.; W. H. Wiley, New York City; S. Whinery and Mrs. Whinery, Somerset, Ky.; L. B. Ward, Jersey City, N. J.; A. S. C. Wurtele, Buffalo; W. W. Wilson, Eng. and Supt. Water-works, Yonkers, N. Y.; H. F. Walling, Topographer U. S. Geological Survey, Washington, D. C.; W. E. Worthen and Mrs. Worthen, New York City; William Watson, Boston; John A. Wilson and Mrs. Wilson. Miss E. B. Wilson and Miss J. M. Wilson, Philadelphia; C. D. Watkins and Miss Watkins, New York City; Charles D. Ward, Miss C. Young and Miss N. Young, Jersey City; A. M. Wellington, *Railroad Gazette*, Mrs. Wellington and Mrs. D. M. Rollins, New York City; Joseph Whitney, Cambridgeport, Mass.; H. M. Wilson, Topographer U. S. Geological Survey, Washington, D. C.; Col. George E. Waring Jr., M. Inst. C. E., Consulting Engineer Buffalo Trunk Sewer, and Mrs. Waring, Newport, R. I.; A. G. Whittemore, Burlington, Vt.; John W. Weston and W. H. Weightman of *American Engineer* and Mrs. Weightman, Chicago, Ill.; W. H. Woodyard, New York City; Herbert A. Young, Asst. Eng. T. C. & St. L. R. R., Toledo, Ohio; E. Sweet Jr., State Engineer, New York; E. P. North and Mrs. North; New York City; E.S. Philbrick, Boston; Benj. Reece, Eng, M. S. Div. L. S&M. S. R. R. Toledo, Ohio.; P. Sanford Ross and Mrs. Ross, Jersey City, N. J.; A. J. Tulloch, Leavenworth, Kansas; C. E. Fogg and Mrs. Fogg, Cleveland, O.; E. A. Flint, Boston; Jos. P. Frizell, Boston, Mass; B. Godwin, New York City; G. S. Gatchell, Gen. Supt. B. N. Y. & P. R. R. Rochester, N. Y.; Bentley D. Hasell. Gen. Man. Charleston S. S. Co. New York City: H. F. Juengst, Ch. Eng. St. Joseph Water Co,; St. Joseph, Mo,; F. G. Lancaster, Buffalo; C. E. Greene, Ann Arbor, Mich,; C. W. Kettell, Librarian Boston Soc. C. E.; J. H. Harlow, Engineer Monongahela Navigation Co., Pittsburg; O. B. Colton Chicago; G. W. Polk, Eng. International Cons. Co., San Antonio, Texas: C. H. Strong, Cleveland: C. S. Maurice, Union Bridge Co.; Athens, Pa.; C. L. Crandall, Cornell University, Ithaca, N. Y.; M. W. Kingsley, Cleveland Water Works, Mrs. Kingsley and Miss L. E. Kingsley; R. P. Rothwell, *Engineering and Mining Journal*, New York City; W. R. Belknap, Louisville G. W. Parsons, Penna. Steel Co, Harrisburg; C. F. Loweth, St. Paul.

American Society of Civil Engineers.

JUNE 4, 1884.

The Society met at 8 p.m., Vice-president Wm. H. Paine in the chair, John Bogart, Secretary.

Ballots were canvassed and the following candidates were elected:

As Members:—James P. Allen, (transferred from Junior) Charleston S. C.; Henry P. Bell, Winnipeg, Manitoba; William F. Biddle, Philadelphia, Pa.; Wendell R. Curtis, (transferred from Junior) Savannah, Ga.; Chauncey Ives, Chambersburg, Pa,; Mace Moulton, Wilmington, Del.; Samuel Rea, Philadelphia, Pa.; Percival Roberts, Jr., (transferred from Associate) Philadelphia, Pa.; Levi L. Wheeler, St. Louis, Mo.

As Associates:—Alan H. G. Hardwicke, Buffalo, N. Y.; William Roberts, Waltham, Mass.

As Juniors:—William H. Briethaupt, St. Louis, Mo.; Allan D. Conover, Madison, Wis.; Martin Gay, West New Brighton, N. Y.; Silas B. Russell, St. Louis, Mo.; Chandler D. Starr, New York City.

A paper was readby A. M. Wellington, M. Am. Soc. C. E., giving the details and results of experiments with a new apparatus upon the friction of Car Journals at Low Velocities. These experiments were undertaken to test the correctness of a series of tests described in a previous paper, which were made by starting cars, from a state of rest down a known grade and deducing the resistances from the velocity acquired. The present experiments were made by an apparatus in which the axle to be tested is placed in an ordinary lathe having a great variety of speeds, the resistance of the axle being measured by the levers connected with a yoke encircling the axle and transmitting the pressures to a suitable weighing apparatus. It was found important that this weighing apparatus should be direct, as for instance, a platform scale rather than a spring scale. The results of these experiments as to initial friction were, that friction at very low journal speed is abnormally great and more nearly constant than any other element of friction.

This abnormal increase of friction is due solely to the velocity of revolution. At velocities slightly greater, but still very low, the friction is still large, the co-efficient falling very slowly and regularly as velocity is increased, but being constantly more and more affected by differences of lubrication, load and temperature, a very slight excess of initial friction would generally be observed. There is no such thing in journal friction as a friction of rest in distinction from a friction of motion. The fact that friction of rest appears to exist is due solely to the fact that no journal or other solid body can be instantly set into rapid motion by any force however great. At ordi-

nary operating velocities the character and completeness of lubrication seems to be much more important then the kind of oil used or even the pressure or temperature.

Comparisons were made of experiments by Prof. Thurston and by Mr. Tower, and the experiments of the author. The rolling friction proper in railroad service seems to be very small indeed, not exceding one pound per ton. As to the resistance of freight trains in starting, it is believed, that the resistance at the beginning of motion in each journal is about twenty pounds per ton. A velocity of from one half to three miles an hour must be obtained before the journal friction falls to ten pounds per ton. At six miles per hour the journal friction is at least one pound per ton higher than at usual working speeds. Temperature exerts a very marked adverse influence upon friction at low velocities. The velocity of lowest journal friction is ten to fifteen miles per hour. With bath or other very perfect lubrication there is a very slight increase of journal friction accompanying velocities up to fifty-five miles per hour. With less perfect lubrication as with pad or syphon, greater velocity is as apt to decrease as to increase the co-efficient. The latter being more like the ordinary lubrication in railroad service, we may say without sensible error that the co-efficient of journal friction is approximately constant for velocities of fifteen to fifty miles per hour.

The paper was discussed by members present. Final announcements were made in reference to the Convention to be held at Buffalo beginning June 10th.

LITERATURE.

Text Book on the Method of Least Squares, by Mansfield Merriman. New York, John Wiley & Sons. 1884. 194 pp., 8 vo., $2.00

In ENGINEERING NEWS, Nov. 3, 1877, we reviewed this book upon its first appearance. As the former edition has been exhausted, the author, professor of civil engineering at Lehigh University, has seized the opportunity in this second edition to recast and make such additions to the book as seemed desirable. The more usual arrangement of a text-book has now been adopted and the work will be eminently serviceable to engineering students and scientific schools. It abounds in illustrations and problems drawn directly from surveying, geodesy, and engineering, so that its practical value is at once apparent to one who opens this book. We need not repeat the commendations bestowed upon the first edition, but for the benefit of those of our readers who would like a further suggestion as to the nature of its contents, will only say anew that it is here shown how to ascertain the most probable length of a base line as properly deduced from varying measurments; the value of an angle which has been repeated with instruments of more or less precision; the adjustment of discordant levels between different objects; the reduction of angles in one or more triangles so that their sum shall equal the proper amount; and, in short, to find, in any case, those values of observed results which shall involve the least error.

The book is handsomely printed, on unusually heavy paper, and is a worthy addition to the previous excellent books which have been published by the Messrs. Wiley.

Geological Survey of New Jersey. Annual Report of the State Geologist for the year 1883. *Geo H. Cook, State Geologist.*

The past year has been mainly occupied in pushing forward the Topographic Survey, and good progress is reported. The Geodetic Survey has also been continued and the major portion of this work is now finished.

According to the report upon the Topographical Survey now being carried forward by Mr. Vermeule, 2856 sq. miles have been surveyed; as the whole area of the State is estimated at 7,576 sq. miles, nearly two-fifths of the area of the State is surveyed, including nearly all the roughest and most difficult portions.

In preparing the maps for publication, 17 sheets of uniform size 24 × 34 inches, will be used for the entire State; the survey will be plotted on a scale of one mile to the inch, or 1 to 63,360; and the maps, numbering generally from the North to the South, will be so arranged that those covering the same geological formation can be easily grouped together. The contour lines will show every rise of 20 ft. in the hilly portions of the State and every 10 ft. in the more level portions. The first maps of the series will be distributed this winter.

In the report upon the Tertiary and Cretaceous Formations of Southern New Jersey, some interesting data are given relating to the artesian wells at Ocean Grove and Asbury Park. The first named is a flowing well, yielding a daily supply of from 60,000 to 70,000 gallons of pure water. For about 50 ft. below the surface the well was lined with a 6 in. iron tube, from that point down to 382 ft. it was bored without tubing; the total depth is 420 ft; a 4 in. pipe being set in the lowest part. The material penetrated is all earthy, no rock; it was made up of dark and light colored clay, green sand, broken shells, and calcareous earth. Little water was met with until a depth of 382 ft. was reached, the bore then struck an open green sand, in grains, and specimens of the *Belemnittella mucronata*; the water rose 18 to 20 ft. above the surface. When the 4 in. pipe was put in and the sand and earth stirred up for 38 ft. further, the yield increased and rose 28 ft. above the surface, the last 16 ft. in the well is an open sand. The water has a temperature of 60° Fahr, is clear and colorless and contains 8.5 cubic inches of carbolic acid per gallon, and 8.19 grains of solid matter in the same quantity. These solid constituents are made up chiefly of sodium chloride, 0.706 grains, potassium sulphate, 1.138, sulphate of lime 1.728, carbonate of lime 2.530, carbonate of magnesia, 0.976 grains. The water-bearing stratum which supplies Ocean Grove is a bed of open sand, formerly described as *Sand Marl*, which has an average dip of 37 ft. per mile, and lies immediately under the Lower Marl bed.

The artesian well at Asbury Park is lined with an 8 in. wrought-iron pipe for 372 ft. deep, and is bored 21 ft. into the earth beyond the pipe; total depth 393 ft. The same material was passed through as at Ocean Grove. The water is pure, without a trace of organic matter: the quantity is not stated.

The report continues with an examination into the Red Sandstone and Trap-rocks, and the Archaen Rocks and Iron-ore. The highest point in the Highlands of New Jersey is located near the Williams mine 2½ miles due south of Vernon, Sussex Co., it is 1,496 ft. above the ocean.

The report concludes with a most detailed and interesting report upon the iron mines of New Jersey, and the methods of exploring for magnetic iron ore, and locating mines.

The expenses of the survey have been kept strictly within the annual appropriation of $8,000.

Publications Received.

Excerpt Minutes of the Institution of Civil Engineers: Pumping Hot Water, by Henry James Coles; Speed on Canals, by Francis Roubiliac Conder; The Adoption of the Standard Forms of Test Pieces for Bars and Plates, by William Hackney, with Abstract and Discussions.

ENGINEERING NEWS: Three months for One Dollar.

CORRESPONDENCE.

Wanted—A Rail Saw.

Special Correspondence Engineering News.

NAPANEE, TAMWORTH & QUEBEC RAILWAY CO., NAPANEE, ONT., May 30, 1884.

EDITOR ENGINEERING NEWS:—Kindly let me know through the columns of ENGINEERING NEWS where I can obtain a rail saw; one that could be used to saw rails in the track by hand or foot power. If you do not know of such a tool, please publish this query and perhaps some of your readers would be kind enough to answer it, and oblige

M. J. BUTLER,
Chief Engineer.

Filling Trestles.

Special Correspondence Engineering News.

BOSTON & LOWELL RAILROAD, BOSTON STATION, June 5, 1884.

EDITOR ENGINEERING NEWS:—In answer to yours of February 20, would say that the contract for filling trestles on M. & K. R. R. has but recently been awarded. The bidders were as follows: Pike and Hall, Boston; Michael Moran, Chelsea, Mass.; Moulton & Mahoney, Lawrence, Mass.; Charles Linnehan, E. Cambridge, Mass.; Munson & Company, Boston; A. F. Williams & Company, Boston; O. Riorden, Putterill & Killian, Boston; Thos. C. Davis, Dedham, Mass.; Conrad Juul, Danvers, Mass.; Danforth & Ward Bros., Kennebuck, Me.; James Savage, Boston; P. Connor, Oswego, N. Y.; E. W. Coghlan, Natick, Mass.; Geo. F. Hitchings, Brookline, Mass.; Brintnall & Ryan, New York. The last-named parties were the successful bidders.

Very truly yours,

ISAAC M. STORY.
Chief Engineer B. & L. R. R.

The Land Surveyors of To-day.

Special Correspondence Engineering News.

LOWELL, MASS., May 21, 1884.

EDITOR ENGINEERING NEWS:—Am sorry that *Surveying* was not a success, for I had hopes that you would succeed in introducing a class journal that would be to surveyors what ENGINEERING NEWS has been, and is, to civil engineers.

So long as surveyors keep themselves down to the level of the surveyors of the past and try to satisfy their clients by running lines with an open sight compass and four rod chain, just so long must they work for the prices which our forefathers got for surveying.

There is a great deal to be learned in land surveying, even by graduate engineers, especially in regard to the legal points that arise in the tracing of disputed lines, where a surveyor needs many times to know a good deal more than the mere manipulation of instruments.

I hope that ENGINEERING NEWS may continue to be of value to surveyors as in the past.

Very truly,

MELVIN B SMITH.

Engineering Colleges.

Special Correspondence Engineering News.

CLEVELAND, O., June 9, 1884.

EDITOR ENGINEERING NEWS:—In your edition of the 7th inst., I notice your answer to an inquiry from Ontario in regard to engineering schools. Possibly my loyalty to Alma Mater perverts my judgment, but I confess some surprise that you do not include in your list the Massachusetts Institute of Technology at Boston. It is certainly a worthy competitor of the Rensselaer Polytechnic at Troy, and as to the success of its graduates, you have only to turn to the pages of its catalogue and note the positions of responsibility held by them to convince you of their standing. The Institute in my day was cursed by a system of overwork, but recently the courses have been remodeled to obviate that in a great measure. The Engineering Department is presided over by one of the most practical and painstaking men in the profession, Prof. Vose, and the opportunity for outside studies and general information, conducive to the success of the profession, is of the best in the country, both at the Institute itself and in the various advantages afforded by the city for general "culture" and progress. At the head of the institution stands Gen. Walker, the worthy successor of the revered founder of the school, Prof. Wm. B. Rogers, whose name carries with it the respect and devotion of all with whom he has ever come in contact.

Hoping this will induce you to revise your list so as to include in it this rapidly improving institution, I remain, respectfully yours,

WM. T. BLUNT.

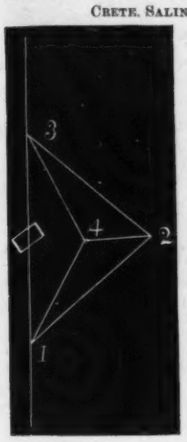
[The omission of the Massachusetts Institute of Technology was unintentional. We have personally visited its class rooms and have been shown much of its "equipment." We confess to associating it more with mining engineering than civil engineering, our impressions having come from a pleasant personal acquaintance with Prof. Richards and Mrs. Richards (also a

teacher) who have that department in charge. We happen to be personally acquainted with the professors of engineering in all the institutions mentioned last week, besides those of several others, and have always received the benefit of their active support. There is an occasional teacher of civil engineering, however, who has no use for a professional journal, and it is but natural that our memory should desert us under such circumstances.—ED. ENG. NEWS.]

Problem in Surveying.

Special Correspondence Engineering News.

CRETE, SALINE COUNTY, NEB., May 20, 1884.



EDITOR ENGINEERING NEWS:—In reply to problem of B. J. Ashley in No. 6 of *Surveying* would say:

At 1 turn off angle of 45° to the right and run to 2, turn off angle of 90° to the left and set two points near the line at 3, turn off 45° and run to 4, observe the angle 2,4,1 and make the angle 2,4,3 the same; the line 4-3 will intersect the lines 2-3 on the true line, at 3 turn off 135° from 2, and you are on the true line.

Yours truly,

JOSEPH S. PHEBUS, C. E.,
Dep. Co. Surveyor.

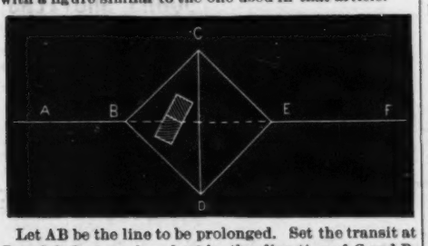
Problem in Surveying.

Special Correspondence Engineering News.

LAKE VILLAGE, N. H., May 24, 1884.

EDITOR ENGINEERING NEWS:—I write this communication on the ground that it is the duty of any craft to support its literature, and its special object is to answer the question of B. J. Ashley, of Mt. Gilead, O., in relation to continuing a line beyond an obstacle without the aid of any measuring instrument.

Article 414 of Gillespie's Land Surveying covers the point, but as that may not be at hand I will copy it here with a figure similar to the one used in that article.



Let AB be the line to be prolonged. Set the transit at B and deflect angles of 45° in the direction of C and B. Set at some point C on one of these lines and deflect from CB 45° and mark the point D where this direction intersects the direction BD. Also at C deflect 90° from CB. Then at D deflect 90° from DB. The intersections of these last directions will fix a point E. At E deflect 135° from EC or ED, and a line EF in the direction of AB will be obtained and may be continued.

Now, sir, you may publish this in any shape or at any time or not at all, as you see fit, whatever you do with it will not hurt my feeling. I have derived benefit from the correspondence column of your paper, and am willing to benefit others in the same way if I see a way to do it. Yours truly,

FRED. W. BRUCE.

[J. B. SPRATT, Co. Surveyor, Sharpsburg, Bath county, Ky., sends a solution same as the last except that he makes the angle CBD = 40° and the other two each 70°; the angle CED will then be 60°. S. B. MERRILL, C. E. Washington, D. C., also sends solution similar method as last.—EDITOR ENGINEERING NEWS.]

The Niagara Cantilever Bridge.

Special Correspondence Engineering News.

ST. CATHARINE, ONT., June 5, 1884.

EDITOR ENGINEERING NEWS:—"There is nothing new under the sun" is an old maxim. Much has been said and written about the Niagara Cantilever Bridge, with its center span of 470 ft., and that great triumph of engineering skill the Frith of Forth cantilever double track railway steel bridge, now being constructed in Scotland, with its three spans of 1,760 ft. each. The principle of the cantilever is of ancient date. It was known to, and practised by, the Assyrians in Asia 2,000 years before Christ. Their shore arms were unhewn sticks of timber, made fast and weighted down in abutments of dry masonry. The center space over the river was connected by a broad, stout matting, made of coarse grass or tough weeds, stiffened crosswise with small, round poles. Over such primitive structures camels, mules and donkeys were accustomed to carry their loads. The design of the cantilever must, therefore, date back to the time of ancient Nineveh. The modern cantilever bridges are in comparison stupendous structures, suited to the requirements of the age, but perfected by machinery for the manipulation of steel and wrought-iron, and by the powerful help of the mighty steam engine, which is the outgrowth of the steam which caused the lid of the little tea-kettle to dance. But as with steam power in the little kettle, so with the cantilever of the Assyrians, *the idea was there*, and only required to be developed to its utmost capacity, but which has taken centuries to accomplish to produce the comparatively cheap, graceful, picturesque and spider-like cantilever steel bridge of our day.

Yours, etc.

J. G. MCGRATH, C. E.

Napanee, Tamworth and Quebec Railway.

Special Correspondence Engineering News.

NAPANEE, ONT., June 9, 1884.

EDITOR ENGINEERING NEWS:—Thinking an item or two from this road would not come amiss, I send the following: 25 miles of track have been laid, and the track layers expect to reach Tamworth next week. A large gang of men are working night and day in the ballast pit, and all possible speed is being made to hurry up the ballasting. Station houses, freight sheds, etc., have been built at Newburgh, Moscow and Enterprise and at other points; platforms are being erected and everything put in shape for an early opening of the road. This road passes through a fine agricultural district, a large number of factories are also tributary to it, and at the north end unlimited quantities of iron ore are to be found. Large quantities of wood are now piled along the line awaiting the completion of the road. In the immediate future, a branch will be built connecting with Kingston and Pembroke to the east, and another to the Ontario and Quebec to the northwest. Yours truly,

M. J. BUTLER,
Chief Engineer.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E. : M. INST. C. E.

(*Continued from page 290*)

DCL., RENO, NEV.

Reno, Washoe Co., Nevada, in lat. 38° 45′ N., long. 119° 25′ W., is in mountainous country on the Truckee River.

Settled in 1869 it was incorporated a town in 1879. Water-works were built in 1873 by a private company, taking the supply from the river through a ditch 14 miles long, which conveys the water to a reservoir constructed in embankment, the inner slopes being paved with stone, covering 16 acres, and 180 ft. above the town.

Distribution is by 8 miles of riveted wrought-iron pipe with screw joints, of 15 to 2 in. in diameter, with 10 fire hydrants, and 28 gates. Service pipes are of iron.

The population in 1880 was 1,302, it is now said to be 4,000.

No further information is given.

A. Evans is President of the company, and A. A. Evans, Superintendent.

DCLI., DULUTH, MINN.

Duluth, Minnesota, in lat. 46° 50′ N., long. 92° W., is at the head of Lake Superior and mouth of the St. Louis River, on undulating ground.

Settled in 1868, it was incorporated a city in the same year. Water-works were built in 1883, by a private company, after plans of Carroll E. Gray, C. E., and under the superintendence of R. P. Corbyn, taking the supply from Lake Superior. An influent pipe extends 230 ft. into the lake in a trunk sunk in the granite bottom, and receives the water through a crib, built in water 40 ft. in depth. The water is pumped by two compound duplex pumps of 2,500,000 gals. daily capacity each, made by the Geo. F. Blake Manufacturing Co., lifting 256 ft. to the reservoir, 40 by 80 ft. in dimension and 20 ft. deep, built of solid granite masonry, the inner walls being vertical; it is enclosed to make it frost-proof.

Distribution is by 8½ miles of wrought-iron pipe of 12 to 4 in. in diameter, with 72 fire hydrants, 30 gates, 4 meters and 200 taps. Service pipes are of Kalmene iron and lead. The town pays $100 yearly for each hydrant. The population in 1880 was 838,000 and in December, 1883, was 15,033.

The capital stock of the company is $250,000. No further financial information is given.

Carroll E. Gray is President of the company and F. L. Denning, Secretary.

WATER.

SILVER CITY, IOWA, is investigating the subject of water-works. Address the Mayor.

A QUANTITY of liquid carbonic acid gas is kept in the steam fire engines of Berlin. On arrival at a fire it is allowed to escape into the steam cylinder, when its expansion drives the engine until a sufficient steam pressure can be obtained. A gain of four or five minutes in setting the pumps at work is thus effected.

THE board of trustees of Blue Island, one of Chicago's suburbs, has decided to borrow $10,000 for the purpose of extending the water system. The village has pumping works and an elevated reservoir of 2,000 barrels capacity, but pipes are only laid through a portion of the town.

THE Pond Engineering Company, St. Louis, have been awarded the contract to furnsih two Pumping Engines for the Victoria Texas Water Works. The engines will have a capacity of 1,500,000 gallons per day, and will be of the Blake improved compound duplex pattern.

SOME people at Cairo, Michigan, are kicking against the proposition to erect water-works in that city. They think water-works will not reduce insurance rates, but seem to lose sight of the fact that water will materially reduce the amount of destruction by fire the town has been accustomed to of late.

AN interesting result of the late earthquake in England has been noticed in the wells of Colchester, the water-level in which commenced to rise soon after the shock, and in a few days reached a point eight feet above the highest ever before known. It now stands at about seven feet above the former high-water mark.

PURIFICATION OF A FOUL RIVER.—It has been proved by Mr. D. F. Hulwa that the water of the Oder, after receiving the sewage of Breslau, whose population exceeds a quarter of a million, is completely purified by the oxygen of the air and the action of vegetation. At a distance of some nine miles below Breslau, no sewage matters could be detected, either by chemical or microscopic means, and the water appeared to be identical in quality with that above the town.

CLEBURNE, TEX. June 4.—The City Council and waterworks contractors have held several conferences today, the probable outcome of which will be that the contractors Messrs. Brown & Douglass, will form a company to operate the system, the city paying the interest on the bonds for fire protection by having the use of a certain number of hydrants. The proposed sale of the works by the city is generally favored, and will doubtless be consummated. The details of the contract are now under consideration.

CLEBURNE, TEX., June 7.—The negotiations between the City Council and the Waterworks company, for the sale of the waterworks, have failed, the parties not being able to reach an agreement. The plan, therefore, seems to have fallen through—for the present at least.

MAPS OF THE AQUEDUCT LINE.—By changing the route through the property of Cyrus W. Field the Aqueduct Commissioners have shortened the line of the new aqueduct 750 ft. At the meeting on Wednesday the Commissioners certified to the Corporation Counsel the maps of the property on the line of the aqueduct from the northerly line of the city to the Harlem River. The maps will be filed in the Registrar's office and application will be made to the courts for the appointment of Commissioners to condemn the land. Before the land can be condemned the property must be advertised for six weeks.

THE SMALL WATER SUPPLY.—The Board of Trade and Transportation on Wednesday appointed Capt. Ambrose Snow, A. B. Miller, and Edmund Driggs a committee to confer with Mayor Edson and with consulting engineers, "in order," according to the resolution, "that questions may be immediately determined whether the present deprivation of our citizens of Croton water, to the extent to which they are now being deprived of it is necessary; whether such supply cannot be safely increased, and if not, what temporary measures of relief can be devised pending the construction of the aqueduct, which will protect our citizens and the mercantile and insurance interests of the city from the dangers which a water famine would of necessity entail upon them."

JACKSON, MICH., on the 6th voted $50,000 for additional Water-works machinery.

THE WASTE OF CROTON WATER.—The reckless waste of Croton water in this city has caused Chief Engineer Isaac Newton to address a letter to Commissioner Thompson calling his attention to the facts in the case, and urging him to appeal to the public to assist the department in economizing the supply. In his letter Mr. Newton says that in many parts of the city where the pressure in the water mains has always been comparatively low it is now so much reduced that the water does not rise above the ground floor. Although the aqueduct is delivering 100,000,000 gallons of water daily to the city reservoirs, yet between May 12 and June 10 the level was lowered 2 ft. and 5 in. Acting upon Mr. Newton's suggestion, Commissioner Thompson issued the following letter:

To the Public:

I am to-day in receipt of a letter addressed to me by the Chief Engineer of the Croton Aqueduct calling attention to the present excess in the consumption of water over the supply which the aqueduct is capable of furnishing, and the perilous effects of a further decrease of pressure in the distributing mains, which will result from a continuance of such excess of consumption. The department is using, with the utmost vigor and vigilance, the authority and means at its command to limit the waste of water by the application of water meters, the inspection of water fixtures in houses, the night inspection of house drains, the stoppage of the water supply to ornamental fountains, the appliance of waste-saving fixtures to drinking fountains, the revocation of permits to use water through hose in washing sidewalks and house-fronts, and in every other possible way. All these measures will not avail to avert the perils of a continuous decrease of pressure in the water supply unless the public shall rise to, and act upon the appreciation of the fact that they must employ the same care in the use of the water which they employ in the use of any of the other necessaries of life. A continuance of the present waste of water by consumers means total deprivation of water supply to certain parts of the city, inadequate pressure and supply for extinguishing fires, paralyzation of industries, danger to the public health, and loss of comfort and convenience to every household. I state these facts in order to place them before the public in the most impressive manner, and to ask the co-operation and assistance of the people and of the several offices of the City Government, especially the police, in the efforts of the department to save the city from the dangers of the situation.

Very respectfully,
HUBERT O. THOMPSON.
Commissioner of Public Works.

HYDE PARK, ILLS., TUNNEL.—At the present time the subject of placing a permanent structure in Lake Michigan, one mile from shore, which shall be a safe and suitable inlet for the admission of the water to the Hyde Park tunnel, now rapidly approaching completion under the bed of the lake at the foot of Sixty-eight street, is occupying the serious attention not only of the Hyde Park trustees but of the leading people of the town. The trustees advertised for bids calling for plans and proposals. All were rejected at the last board meeting. It is not within the means of the village to construct such a crib as Chicago possesses, hence a cheaper construction must be adopted. The consulting engineer of the village, J. A. Cole, has submitted an opinion on the subject matter, of which the following is a brief extract: A vast number of different designs might be prepared for this purpose. All would fall under one of three general plans viz., either, first, a breakwater plan like those of Chicago and Cleveland, where a substantial breakwater incloses the inlet shaft, but entirely detached from it; or, second a caisson plan, where a broad foundation is secured by sinking a caisson into the clay and laying beneath it a solid foundation of masonry, so as to construct a shaft in and as a part of the structure, as bridge-pier foundations are often constructed; third, a trunk plan (if it may be so called, from its likeness to the trunk of a tree), where the shaft itself is made to be the foundation of the superstructure. The essentials are strength, durability, large and free waterways, reliable provision for shutting off water, ability to exclude sand, avoid stoppage by anchor ice, and facility of construction. The bed of the lake is composed of layers or masses of clay, interspersed with pockets of sand, gravel, and bowlders. The clay is sometimes very soft and plastic—sometimes as hard as rock. To obtain the greatest possible strength I would adopt cast iron and masonry. A foundation in such material should be deep, and for purposes of a tunnel inlet must be immovable, for the least settlement or change might and probably would occasion a leak which would be beyond control. In taking the trunk plan the shaft itself is made to carry the superstructure, affording by this means a solid pier of masonry and iron twenty-five feet in depth, resting upon rock or indurated clay. The superstructure will be of immense strength and will present but a small surface as a resistance to the waves and currents. To secure an ample passage for water the form of a truncated pyramid is adopted, having a base eighteen feet in diameter, making ten or more large openings immediately above the shaft, the united area of which is five times the area of the tunnel section. All gates or valves for shutting off the water supply will be discarded The shutting can be made complete by nicely fitting cores, which can be placed over the openings of the inlet, and securely fastened to them with an intervening gasket. The subject of construction is a vital one.

The inlet is be placed one mile from shore, ten miles from the Chicago harbor, in a depth of twenty-seven feet of water, on the bed of a lake which is lashed to fury by the storms which follow each other at short intervals. The solution of the question is anxiously looked for.

NEWS OF THE WEEK.

Railroads and Canals.

VERNON SMITH, civil engineer, who has charge of one of the surveying parties in the proposed route of the short line to Halifax from Ottawa, has returned there to consult with Collingwood Schrieber, chief engineer of the Government railways He reports a feasible and straight line between Canterbury and the north of Moosehead Lake, a distance of 130 miles. One of the advantages offered by this route would be its important connections at both ends with the systems in operation.

PACIFIC AND GREAT EASTERN.—The directors of the Great Eastern Railroad Construction, and Land Company have resolved to build the end of the road 350 miles from Cincinnati, Washington county, Ark., to the eastern state line of Arkansas. The work will begin before September 1st. The route penetrates the tier of counties of northern Arkansas, abounding in timber and materials.

WINFIELD, JUNE 4.—Crisswell township in this county yesterday voted $35,000 aid to the Kansas City and Southwestern railroad. This is a proposed line from Kansas City to the south line of the State, by way of Leroy or Burlington, Eureka and Winfield. The enterprise is backed by heavy capitalists in Chicago, and is receiving the enthusiastic support of the people all along the line.

SOUTH AMERICAN PROJECTS.—The great railway contract for the construction of three grand trunk lines has been signed by the Governor of the province of Buenos Ayres, and is now before the provincial legislature. Brown and Honore are the contractors. This is, perhaps, one of the greatest contracts in the country, as it means 1,500 kilometres of new railways, built at an outlay of $28,000,000 fresh foreign capital.

ALTOONA, PENN., June 5.—The Cresson, Clearfield County, and New York Short Route Railroad Company broke ground on Tuesday last near Flynnsdove, in Cambria county. Eighty men and about 30 teams were put to work. Frederick Jackel, the leading spirit in this enterprise, went to New York this evening, and will return on Tuesday next with 500 Italians, who will be put to work at once. The road will be completed about the 1st of November, and will run through one of the finest coal and timber countries in Pennsylvania.

VENEZUELAN PROJECTS.—Only two lines of railway in Venezuela can at the present time be considered as serious enterprises; one is the old Bolivar Railway from Tucacas to La Luz, belonging to the Quebrada Railroad, Land, and Copper Company, of London, and the other, the line opened last year from, La Guayra to the city of Caracas, and owned by the La Guayra and Caracas Railroad Company. With regard to the first of these lines Messrs. De Rojas Brothers & Co., state that the government of Venezuela has offered a concession for its prolongation from La Lus to the town of Barquisimeto, a distance of about 60 miles.

A NEW DEPARTURE IN RAILROAD SIGNALING.—For the past week Mr. L. C. Huber, of Huber, Ky., has been engaged in putting on the Pittsburg, Cincinnati and St. Louis Railroad his pneumatic signal. The signal is an air whistle placed upon the caboose or last car of a freight train. It consists of an eccentric placed upon the axle of the car. The revolution of the axle while the car is in motion is the motive power for the eccentric, which is connected and operates an air-pump. From the pump, air is forced into and compressed in an air-drum until a pressure of 90 or 100 pounds to the square inch is obtained. Leading out of the air-drum is a whistle pipe terminating above the roof of the caboose in a whistle, which is operated either from the inside or on top of the caboose.

The object of this method of signaling by sound is to at all times and in any condition of weather put the train employés in instantaneous communication with one another, which has not been accomplished by any other system, and especially is the present method defective, which is by signs, the efficacy of which depends wholly upon whether the person for whom the signal is intended is looking in the direction of the signal being given. Mr. Huber has overcome this defect by controlling the men by sound, and the advantage of his system is that any man on the train, who can hear, is instantly controlled by the whistle. A test was given on the Little Miami Road recently, and it proved satisfactory.

ST. LOUIS, MO., June 5.—The Elevated Railroad bill was passed by the City Council last night, and is now a law. A number of New York capitalists are concerned in the enterprise. The road will run from the business center of the city to the western limits, with branches to the northern and southern suburbs.

MEXICO'S method of dealing with outlaws: Since the attacks on the trains of the Mexican Central Railway by bandits a force of 800 cavalry under Gen. Pinon has been scouring the country in the region of the crimes, protecting the railway and arresting the evil-doers. Of a party of seven who were arrested, three, the leader and two of the most notorious, were shot. Before the execution they confessed their crime, and said that they were assisted by a foreman and four men of a section gang employed on the railway, who removed a rail from the track and wrecked a train. The prompt and decisive action of the troops has inspired the robbers with a wholesome fear, and they are careful not to be seen near the railway for fear of capture and death, or of being sent to Yucatan, which in their eyes is considered a worse penalty than death. The local Mexican authorities have been very dilatory in adopting measures to prevent the wrecking and robbing of trains, or to render assistance to the goverment troops, but by commendable energy and activity the troops have captured the greater part of the bandits, and they have either been shot or otherwise severely punished. This has been such an example to others who would engage in such pastimes as to deter them from evil doing, and to make travel over the new line as safe as in the United States. Denver *Tribune*.

IRON, METAL AND COAL MARKETS.

PHILADELPHIA, June 19, 1884.

Steel Rails are quoted in large lots, for winter delivery, at $32, but even this remarkably low figure does not attract buyers, and to all appearances prices are on the down grade, with $31 as the probable limit before the close of summer. Crop Ends are $20.50 at mill; English, $21; Welsh, $20; Spiegeleisen, $28; Bessemer, $19.50; Standard Foundry Iron, $20 for No. 1; $17.50 for Gray Forge. Buyers are holding back all through the market, and the transactions of the past week have been of very trifling proportions. Construction Iron is in good request, but only in small lots. Sales of Nails have been made here at $2.35.

PITTSBURG, June 19, 1884.

Inside figures to-day are, No. 1 Foundry, $19; No. 2, $18; Grey Forge, $16.50@$17; Bessemer Pig, $21; Steel Rails nominally, $35, but better terms can be had. The railroad builders are in no hurry whatever just now. The people of the East End are greatly excited over natural gas, and meetings are being held with a view of forming a pool in order to operate on a large scale. The stove holders will start up with non-union men if possible. A general strike is probable along the Monongahela River. All the glass factories will be out in two weeks. The demand is very active and the supply limited.

CHICAGO, June 18, 1884.

The improving crops and the short stocks of iron and steel, together with the fair demand for all kinds of hardware, wire and tools, are leading to a little more confidence in the iron trade and in general business circles. Prices show but little variation. The manufacturing towns within 100 miles of Chicago are not restricting their labor force, and a perceptible increase in orders is observable. The Barbed Wire manufacturers are taking a good many orders for fall delivery. The Tool makers of the city have booked more orders during the past two weeks than during the previous month. The Steel Rail makers are doing but little The Bar mills are short of orders. The Steel mills are well supplied with business. Nails are declining and the policy of the Western Nail makers has not yet been determined upon.

COAL.

PHILADELPHIA, June 19, 1884

The Reading Railroad Company have issued their June circular. No change in prices has been made except an advance of 35c. per ton on Lykens Valley Broken and Egg. The shut-down of last week, and the coming one of next week, have had the effect of making prices a little firmer, though as yet dealers have not advanced. The Cambria Mining and Manufacturing Company have decided to develop their large fields near Sonman Station. General trade is very quiet, and only pressing requirements are being met. Bituminous Coal dealers report an equal dulness in their specialty and do not anticipate any marked improvement for some time to come.